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THE STATE FORESTER OF MASSACHUSETTS.

SIXTH ANNUAL REPORT

1909.

F. W. RANE, State Forester.

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The State Board of Publication.

The Commonwealth of Massachusetts.

To the General Court.

It is with great pleasure that I submit this the sixth annual report of the State Forester of this Commonwealth.

Owing to the fact that the work of suppressing the gypsy and brown-tail moths has been placed under this department by the last Legislature, this report is divided into two parts: —

Part I. General Forestry.
Part II. Gypsy and Brown-tail Moth Work.

This report is submitted in accordance with the provisions of chapter 409, section 5, Acts of 1904, and contains a statement of the results obtained during the year 1909, together with a record of expenditures and recommendations concerning the future needs of the department.

Respectfully submitted,

F. W. RANE,
State Forester.

Dec. 31, 1909.

CONTENTS.

PART II. — GYPSY AND BROWN-TAIL SUPPRESSION.

SAVORY WAYS, IN THE TOWN OF CARVER. — The planter of these trees by the roadside was a public benefactor. If white pines will grow as well as this along a dry and compact roadside in forty years, imagine what better forestry could accomplish throughout our State.

The Commonwealth of Massachusetts.

SIXTH ANNUAL REPORT OF THE STATE FORESTER.

Introduction.

Never has there been a time in the history of the State when forestry matters more need the wholesome consideration of your honorable body than the present. Forestry and forest products have been our birthright, and we do well to reflect upon their importance to the present in the building of our ship of State, and not lose sight of the necessity of conserving them for our future needs. The histories of older nations are an open book to us, and tell only too well their pathetic tale.

The year has been one of great activity, and forestry interests have been given more recognition than ever before. The forestry legislation has been well received by our people. It may not be in good taste to boast of our new laws, but we do wish it known that the American Forestry Association has recommended several of our enactments for general adoption.

During the present year the results from organization and a more definite policy have been very evident. The forest warden system, which was fully explained in last year's report, has been very effective, and we have but just begun to see its usefulness. It takes time to create a proper forestry sentiment, let alone appreciation. Not only have a larger per cent. of the forest wardens and their deputies shown increased interest this year, but many, — a great many, — of our most public-spirited and influential people from every section of the State have co-operated in the forward movement of forestry endeavors.

The services of the State Forester have been in constant demand, not only in making examinations and giving advice on forestry matters, but for lectures, demonstrations and for-

estry literature. More fire warning notices and forest law posters have been distributed and actually found posted in the towns of the Commonwealth than ever before.

The permit act for setting fires out of doors was very generally adopted last spring by the towns and cities throughout the State, and it is the opinion of the wardens generally that this legislation alone will be a great saving to the State from forest fires.

For the first time the forest wardens have been gathered together at conferences, which will be explained in detail elsewhere in this report. In thus acquainting these officers with their duties, we shall secure an efficiency not possible heretofore.

By an act of the last General Court the work of suppressing the gypsy and brown-tail moths was placed under the State Forester. This bill was signed by Governor Draper on March 14. Since that time, of course, the State Forester's duties have been greatly enlarged. It was found advisable to unite the offices, and, as there was not sufficient room to accommodate both departments in the State House, the office of the State Forester was transferred to No. 6 Beacon Street, tenth floor. In the readjustment of these two departments under one head, the aim has been to retain and adopt all the better features of each organization. The experience of the first half-year has resulted in a more effective organization than has seemed possible.

Ever since coming to Massachusetts in the capacity of State Forester, my work has certainly been met with public-spirited encouragement; and now, under my enlarged duties, I simply ask that you give me the same cordial and co-operative support as in the past. Any State department, having the spending of money for the public good, appreciates and covets assistance from the people generally. We propose to have a "live wire" organization in all our undertakings in the State Forester's work; and I believe I am not overstating it when I say that the citizens of Massachusetts generally are in accord in requesting you, the General Court, to enact laws sufficient for our present and future forestry interests.

Organization.

The placing of the moth work under the State Forester by the Legislature and through the recommendation of Governor Draper necessitated a reorganization of the work, to meet the new requirements of the office.

It is to be expected that in the union of forces it will take time to adjust the machinery to the new conditions; but I am frank to say that all members of the organization have adapted themselves most happily to the new system, and, although nine months only have passed, the work is running on smoothly. What is true in this respect in the office force is equally true in the field work. The moth men are not only showing renewed interest in their work, but are assisting in perfecting better forestry conditions, assuming responsibility, and showing interest in preventing and extinguishing forest fires. The forestry assistants are helping in such work as marking the trees and superintending the thinning work so necessary in combating gypsy moths, and at the same time benefiting the growth from a modern forestry standpoint.

After going over the organization carefully and discussing the matter fully with men experienced in the work, under the sanction of the Governor, the 6 divisions into which the moth-infested district was formerly divided were reorganized, and increased to 15. With 6 divisions each agent in charge had an average of 35 towns to look after, and he was allowed a number of inspectors to accomplish the necessary field work. In all, 53 men were employed in the old organization. In the new organization of 15 divisions the 6 agents were given the more difficult ones, and the remaining 9 were filled by experienced inspectors. Four other inspectors were retained for special duties, subject to the direction of the main office. From 53 men, therefore, the force has been cut down to 19, and by furnishing the present division superintendents with motor cycles, with only 12 to 15 towns to cover, they can readily keep in close touch with local conditions. Not only do I believe that our efficiency is greater, but in a year's time it is believed the saving to the Commonwealth, even after deducting the expense of motor cycles, will be $8,000 to $10,000.

The next step needed is in raising the standard of the local town superintendents. The moth work has now progressed far enough so that competent men are available, and it is poor business policy to be compelled to have the work in some towns and cities in the hands of men utterly unable to get the best possible results.

The present organization of the State Forester's staff is as follows: —

STAFF.

Mr. F. W. Rane, B.Agr., M.S.,	State Forester.
Mr. L. H. Worthley,	Assistant Forester, in charge of moth work.
Mr. H. O. Cook, M.F.,	Assistant Forester, in charge of forestry management.
Mr. R. S. Langdell,	Assistant Forester, in charge of nursery work.
Mr. Gould, M.F.,	Assistant Forester.
Mr. Chas. O. Bailey,	Secretary.
Miss Elizabeth Hubbard,	Clerk, in charge of accounts.
Mr. F. P. Woodbury, A.B.,	Clerk, in charge of forest fire records.
Miss Charlotte Jacobs,	Clerk, in charge of mail and office.
Mr. George A. Smith,	Agent, Division 1, as follows: Chelsea, Danvers, Everett, Hamilton, Ipswich, Lynn, Lynnfield, Marblehead, Middleton, Nahant, Peabody, Revere, Salem, Swampscott, Wenham and Winthrop.
Mr. John W. Enwright,	Agent, Division 2, as follows: Arlington, Bedford, Billerica, Burlington, Lexington, Malden, Medford, Melrose, Reading, Saugus, Stoneham, Wakefield, Wilmington, Winchester and Woburn.
Mr. Chas. W. Minott,	Agent, Division 3, as follows: Belmont, Brookline, Cambridge, Concord, Lincoln, Natick, Needham, Newton, Somerville, Sudbury, Waltham, Watertown, Wayland, Wellesley and Weston.
Mr. Frank A. Bates,	Agent, Division 4, as follows: Abington, Avon, Braintree, Cohasset, Hanover, Hingham, Holbrook, Hull, Milton, Norwell, Quincy, Randolph, Rockland, Scituate and Weymouth.
Mr. Francis C. Worthen,	Division Superintendent, Division 5, as follows: Amesbury, Boxford, Georgetown, Groveland, Merrimac, Newbury, Newburyport, Rowley, Salisbury, Topsfield and West Newbury.
Mr. Henry F. Armstrong,	Division Superintendent, Division 6, as follows: Andover, Chelmsford, Dracut, Haverhill, Lawrence, Lowell, Methuen, North Andover, North Reading and Tewksbury.
Mr. Thomas W. Emerson,	Division Superintendent, Division 7, as follows: Acton, Ayer, Boxborough, Carlisle, Dunstable, Groton, Littleton, Pepperell, Townsend, Tyngsborough and Westford.

Mr. Clarence W. Parkhurst,	Division Superintendent, Division 8, as follows: Ashland, Bellingham, Dover, Framingham, Franklin, Holliston, Medfield, Medway, Millis, Norfolk and Sherborn.
Mr. Wm. A. Hatch,	Division Superintendent, Division 9, as follows: Canton, Dedham, Foxborough, Hyde Park, Norwood, Plainville, Sharon, Stoughton, Walpole, Westwood and Wrentham.
Mr. George A. Sands,	Division Superintendent, Division 10, as follows: Blackstone, Grafton, Hopedale, Hopkinton, Hudson, Marlborough, Maynard, Mendon, Milford, Northborough, Northbridge, Southborough, Stow, Upton, Uxbridge and Westborough.
Mr. Harry B. Ramsey,	Agent Division 11, as follows: Ashby, Auburn, Berlin, Bolton, Clinton, Fitchburg, Gardner, Greenfield, Harvard, Holden, Lancaster, Leicester, Leominster, Lunenburg, Millbury, Oxford, Palmer, Princeton, Shirley, Shrewsbury, Springfield, Sutton, Templeton, Warren, Westminster and Worcester.
Mr John A. Farley,	Agent, Division 12, as follows: Carver, Duxbury, Halifax, Hanson, Kingston, Marshfield, Pembroke, Plymouth, Plympton and Whitman.
Mr. Lewis W. Hodgkins,	Agent, Division 13, as follows: Attleborough, Bridgewater, Brockton, East Bridgewater, Easton, Lakeville, Mansfield, Middleborough, North Attleborough, Raynham, Taunton and West Bridgewater.
Mr. John F. Carleton,	Division Superintendent, Division 14, as follows: Barnstable, Bourne, Brewster, Dennis, Falmouth, Marion, Mashpee, Orleans, Rochester, Sandwich, Truro, Wareham, Wellfleet and Yarmouth.
Mr. Saul Phillips,	Division Superintendent, Division 15, as follows: Beverly, Essex, Gloucester, Manchester, North Shore Woodlands and Rockport.

Co-operative Scientific Staff.

L. O. Howard, Ph.D.,	Chief United States Bureau of Entomology, Washington, D. C., *Parasites and Predaceous Insects.*
Theobald Smith, Ph.B., M.D.,	Professor of Comparative Pathology, Harvard University, *Diseases of Insects.*
Roland Thaxter, Ph.D.,	Professor of Cryptogamic Botany, Harvard University, *Fungous Diseases affecting Insects.*
E. L. Mark, Ph.D., LL.D.,	Director of the Zoölogical Laboratory, Harvard University, *Protozoa and Insect Life.*
W. M. Wheeler, Ph.D.,	Professor of Entomology, Harvard University, *Experimental Entomologist.*
C. H. Fernald, Ph.D.,	Professor of Entomology, Massachusetts Agricultural College, *Consulting Entomologist.*
M. L. Guptil,	Expert experimentalist.
Frank H. Moshier,	Entomologist in charge of laboratory.

List of Forest Wardens and Local Moth Superintendents.

[Alphabetically by towns.]

Town or City.	Badge No.	Forest Warden.	Local Moth Superintendent.
Abington,	287	B.Ernest Wilkes, chief fire department,	C. Frederick Shaw.
Acton,	181	William H. Kingsley,	James O'Neil.
Acushnet,	275	Eben F. Leonard,	– –
Adams,	7	John Clancy,	– –
Agawam,	93	Edward M. Hitchcock,	– –
Alford,	24	John H. Wilcox,	– –
Amesbury,	228	James E. Feltham, chief fire department.	A. L. Stover.
Amherst,	67	G. E. Stone, tree warden,	– –
Andover,	212	J. H. Playdon, tree warden,	J. H. Playdon.
Arlington,	193	Walter H. Pierce, chief fire department,	William H. Bradley.
Ashburnham,	104	William D. Miller,	– –
Ashby,	158	Wm. S. Green,	H. A. Lawrence.
Ashfield,	50	Chas. A. Hall,	– –
Ashland,	200	H. H. Piper,	H. G. Spring.
Athol,	105	Frank P. Hall, chief fire department,	– –
Attleborough,	265	Hiram Packard, 3 Hope Street, chief fire department.	Wm. E. S. Smith.
Auburn,	123	J. Fred Searle,	– –
Avon,	259	E. Walter Packard, constable,	Willard W. Beals.
Ayer,	169	Charles E. Perrin,	Loring A. Carman.
Barnstable,	315	Henry C. Bacon, P. O. Hyannis,	Harry W. Bodfish.
Barre,	142	D. H. Rice,	– –
Becket,	23	Elmer D. Ballou,	– –
Bedford,	179	Chas. E. Williams,	W. A. Cutler.
Belchertown,	73	James A. Peeso, constable,	– –
Bellingham,	326	L. F. Thayer, town treasurer,	Henry A. Whitney.
Belmont,	194	John F. Leonard, chief fire department,	Chas. F. Houlahan.
Berkley,	271	Gideon H. Babbitt,	– –
Berlin,	139	Walter Cole, constable,	Willis Rice.
Bernardston,	39	E. E. Benjamen,	– –
Beverly,	220	Robert H. Grant, chief fire department,	Josiah B. Brown.
Billerica,	173	Geo. C. Crosby, chief engineer fire department.	Francis J. Dolan.
Blackstone,	114	Thomas Reilly,	– –
Blandford,	81	H. K. Herrick,	– –
Bolton,	146	Frank A. Powers, tree warden,	Chas. E. Mace.
Boston,[1]	–	– – –	D. Henry Sullivan.

[1] No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

Town or City.	Badge No.	Forest Warden.	Local Moth Superintendent.
Bourne,	311	Emory A. Ellis, P. O. Bournedale,	Stillman B. Wright.
Boxborough,	182	M. L. Wetherbee, selectman,	John J. Sherry.
Boxford,	218	Harry L. Cole, selectman,	Chas. Perley.
Boylston,	138	Chas. S. Knight, metropolitan watchman.	– –
Braintree,	244	James M. Cutting, special police, P. O. South Braintree.	E. E. Abercrombie.
Brewster,	318	T. B. Tubman, highway surveyor, P. O. North Brewster.	David A. Newcomb.
Bridgewater,	293	Edwin S. Rhoades,	Robert J. McNeeland.
Brimfield,	99	Edward J. Prindle,	– –
Brockton,	286	Harry C. Marston, chief fire department.	Edward Moltan.
Brookfield,	120	David N. Hunter,	– –
Brookline,	237	Geo. H. Johnson, chief fire department,	Ernest B. Dane.
Buckland,	49	William Sauer, P. O. Shelburne Falls,	– –
Burlington,	178	Walter L. Skelton, tree warden,	Walter W. Skelton.
Cambridge,[1]	–	– – –	J. F. Donnelly.
Canton,	249	Laurence Horton, fire engineer, P. O. Ponkapoag.	Augustus Hemenway.
Carlisle,	171	Herbert P. Dutton, selectman,	G. G. Wilkins.
Carver,	304	Eugene E. Shaw,	Herbert F. Atwood.
Charlemont,	42	Fred D. Legate,	– –
Charlton,	115	Carlos Bond,	– –
Chatham,	320	Geo. H Eldredge,	– –
Chelmsford,	172	Arthur E. Barton,	M. A. Bean.
Chelsea,[1]	–	– – –	J. A. O'Brien.
Cheshire,	11	Chas. D. Cummings,	– –
Chester,	80	William H. Babb,	– –
Chesterfield,	63	Chas. A. Bisbee, P. O. Bisbee,	– –
Chicopee,	87	John H. Pomphret, chief fire department.	– –
Chilmark,	308	Ernest C. Mayhew,	– –
Clarksburg,	3	Robert Lanfair, R. F. D. No. 1, P. O. North Adams.	– –
Clinton,	145	Daniel W. Goss, 40 East Street,	Wm. McGown.
Cohasset,	246	Wm. J. Brennock, captain fire department.	Joseph E. Grassie.
Colrain,	37	Wm. H. Davenport,	– –
Concord,	180	G. E. Morrell, chief fire department,	H. P. Richardson.
Conway,	51	Chas. Parsons, tree warden,	– –
Cummington,	60	W. S. Gabb, P. O. Swift River,	– –
Dalton,	14	William M. Colton, forester, Flint Stone Farm.	– –
Dana,	147	Elmer A. Collier, chief fire department, P. O. North Dana.	– –

[1] No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

Town or City.	Badge No.	Forest Warden.	Local Moth Superintendent.
Danvers,	210	Thos. E. Tinsley, tree warden,	Thos. E. Tinsley.
Dartmouth,	278	John W. Howland, P. O. North Dartmouth.	– –
Dedham,	241	George A. Phillips,	George A. Phillips.
Deerfield,	52	Wm. L. Harris, selectman,	– –
Dennis,	317	Alpheus P. Baker, constable, P. O. South Dennis.	H. H. Sears.
Dighton,	272	Ralph Earle,	– –
Douglas,	112	W. L. Church, county commissioner,	– –
Dover,	240	John Breagy,	Arthur Hagerty.
Dracut,	163	Daniel D. Fox,	Herbert C. Jones.
Dudley,	110	F. A. Putnam,	– –
Dunstable,	161	Dexter Butterfield,	James A. Davis.
Duxbury,	303	Fred B Knapp, master Powder Point School.	Henry A. Fish.
E. Bridgewater,	298	Loren A. Flagg, chief fire department, P. O. Elmwood.	Wm. T. Greene.
E. Longmeadow,	95	Asher Markham,	– –
Eastham,	322	W. Horton Nickerson, road surveyor,	– –
Easthampton,	77	Frank P. Newkirk, tree warden,	– –
Easton,	264	John Baldwin, chief fire department, P. O. North Easton.	R. W. Melendy.
Edgartown,	309	George N. Cleveland,	– –
Egremont,	29	Frank W. Bradford, Great Barrington, R. F. D. No. 3.	– –
Enfield,	74	Chas. W. Felton,	– –
Erving,	46	Ch. H. Holmes, selectman, P. O. Farley,	– –
Essex,	233	Otis O. Story, tree warden,	Otis O. Story.
Everett,[1]	–	– – –	James Davidson.
Fairhaven,	276	Albert C. Aiken,	– –
Fall River,	280	William Mulligan, tree warden,	– –
Falmouth,	312	J. M. Watson,	W. B. Bosworth.
Fitchburg,	157	Geo. H. Hastings, superintendent,	Geo. H. Hastings.
Florida,	5	Fred R. Whitcomb, P. O. Hoosac Tunnel.	– –
Foxborough,	261	Ernest A. White, chief fire department and constable.	Frank C. Carpenter.
Framingham,	197	James Stalker, P. O. South Framingham, assistant tree warden.	N. I. Bowditch.
Franklin,	255	Edward S. Cook, dealer in wood and lumber.	M. J. Van Leeuwen.
Freetown,	274	Andrew M. Hathaway, P. O. Assonet,	– –
Gardner,	153	Theodore W. Danforth,	T. W. Danforth.
Gay Head,	343	Leander B. Smally, Menemsha, Mass.,	– –
Georgetown,	224	Clinton J. Eaton,	Edward J. Watson.
Gill,	45	Lewis C. Munn,	– –

[1] No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

Town or City.	Badge No.	Forest Warden.	Local Moth Superintendent.
Gloucester,	234	– – –	Herbert J. Worth.
Goshen,	61	Sidney F. Packard, P. O. R. F. D. No. 2, Williamsburg.	– –
Gosnold,	344	Harold S. Veeder, P. O. Cuttyhunk,	– –
Grafton,	125	Sumner F. Leonard, overseer of the poor.	Chas. K. Despeau.
Granby,	79	C. N. Rust,	– –
Granville,	91	Laurence F. Henry, selectman,	– –
Gt. Barrington,	25	Daniel W. Flynn, 54 Russell Street,	– –
Greenfield,	44	William A. Ames, tree warden,	Wm. A. Ames.
Greenwich,	327	William H. Walker, P. O. Greenwich Village.	– –
Groton,	167	James B. Harrington, chief fire department.	William A. Woods.
Groveland,	225	Sidney E. Johnson, 311 Center Street,	Raymond B. Larive.
Hadley,	66	Edward P. West, tree warden,	– –
Halifax,	299	Edwin H. Vaughan, assessor,	Frank D. Lyon.
Hamilton,	222	Fred Berry, P. O. Essex, R. F. D.,	Fred A. Nason.
Hampden,	97	John S. Swenson,	– –
Hancock,	9	Chas. F. Tucker,	– –
Hanover,	295	Chas. E. Damon, P. O. Box 113, North Hanover.	Lyman Russell.
Hanson,	296	Albert L. Dame, tree warden, P. O. South Hanson.	A. L. Dame.
Hardwick,	141	Myron N. Ayres, constable,	– –
Harvard,	152	Benjamin J. Priest,	Geo. C. Maynard.
Harwich,	319	John Condon,	– –
Hatfield,	65	John M. Strong, P. O. West Hatfield,	– –
Haverhill,	216	John B. Gordon, chief fire department,	Geo. F. Moore.
Hawley,	48	Ernest R. Seare, tree warden, P. O. Charlemont.	– –
Heath,	36	S. G. Benson,	– –
Hingham,	289	Geo. Cushing, chief fire department,	Arthur W. Young.
Hinsdale,	15	Lewis B. Brague, tree warden,	– –
Holbrook,	247	E. W. Austin,	William Hayden.
Holden,	136	Henry E. Holt,	H. E. Holt.
Holland,	101	O. F. Howlett, P. O. Southbridge, R. F. D. No. 2.	– –
Holliston,	202	Waldo E. Collins,	Geo. H. Moody.
Holyoke,	85	Chas. C. Hastings,	– –
Hopedale,	328	Walter F. Durgin, constable, superintendent of parks.	Walter F. Durgin.
Hopkinton,	201	R. I. Frail,	John T. Riley.
Hubbardston,	149	Ernest A. Young, tree warden,	– –
Hudson,	199	Fred W. Trowbridge, chief fire department.	R. H. Hapgood.
Hull,	329	Smith F. Sturges, tree warden, P. O. Allerton.	John Knowles.

List of Forest Wardens and Local Moth Superintendents — Con.

Town or City.	Badge No.	Forest Warden.	Local Moth Superintendent.
Huntington,	70	Daniel B. Mack, constable,	– –
Hyde Park,	330	Harry G. Higbee,	Harry G. Higbee
Ipswich,	223	Augustus J. Barton,	James A. Morey.
Kingston,	301	Thos. W. Bailey, selectman,	Carl C. Faunce.
Lakeville,	283	Nathan F. Washburn, P. O. Middleborough.	S. T. Nelson.
Lancaster,	151	Everett M. Hawkins, chief fire department.	Geo. F. Morse, Jr.
Lanesborough,	10	King D. Keeler, constable,	– –
Lawrence,	214	Chas. G. Rutter, chief fire department,	Isaac Kelley.
Lee,	22	James W. Bossidy,	– –
Leicester,	122	Walter E. Sprague,	J. H. Woodhead.
Lenox,	18	Geo. W. Fitch,	– –
Leominster,	155	William K. Morse, chief fire department, P O. North Leominster.	S. R. Walker.
Leverett,	57	Orman C. Marvel, assessor,	– –
Lexington,	188	Azor P. Howe,	E. P. Merriam.
Leyden,	38	Herman W Severance, Bernardston,	– –
Lincoln,	187	Edward R. Farrer, tree warden,	Edward R. Farrar.
Littleton,	170	Chas. F. Johnson, town clerk,	Alfred Hopkins.
Longmeadow,	94	Oscar C. Pomeroy,	– –
Lowell,	165	Edward S. Hosmer, chief fire department.	Charles A. Whittet.
Ludlow,	88	Edward E. Chapman, constable,	– –
Lunenburg,	156	Clayton E. Stone,	Stephen Farnsworth.
Lynn,	331	Nathan M. Hawkes, park commissioner,	Albert C. Doal.
Lynnfield,	209	Thos. E. Cox, P. O. Wakefield R. F. D.,	Alfred W. Copeland.
Malden,	191	Frank Turner,	Geo. W Stiles.
Manchester,	236	Frederick Burnham,	John D. Morrison.
Mansfield,	263	Herbert E. King,	W. O. Sweet.
Marblehead,	332	William H Stevens,	William H. Stevens, 2d.
Marion,	306	Isaac E. Hiller,	James H. Morss.
Marlborough,	198	Chas. H. Andrews, chief fire department.	M. E. Lyons.
Marshfield,	292	Edward E. Ames,	P. R. Livermore.
Mashpee,	313	Joseph A. Peters,	Watson F. Hammond.
Mattapoisett,	281	Everet C. Stetson,	– –
Maynard,	184	Arthur J. Coughlan, room 17, Maynard's block.	Albert C. Coughlin.
Medfield,	252	Waldo E. Kingsley, chief fire department.	Geo. L. L. Allen.
Medford,	192	Chas. Bacon, chief fire department,	Wm. J. Gannon.
Medway,	254	Clyde C. Hunt, captain fire department.	Frank Hager.
Melrose,	–	– – –	John J. McCullough.

List of Forest Wardens and Local Moth Superintendents — Con.

Town or City.	Badge No.	Forest Warden.	Local Moth Superintendent.
Mendon,	119	Geo. B. Cromb,	Frank M. Aldrich.
Merrimac,	227	Edgar P. Sargent,	Frank E. Bartlett.
Methuen,	213	Herbert B. Nichols,	Alfred H. Wayland.
Middleborough,	284	C. W. Weston,	John C. Chase.
Middlefield,	342	Thos. H. Fleming, P. O. Bancroft,	– –
Middleton,	211	Oscar H. Sheldon,	Benj. T. McGlauflin.
Milford,	127	Elbert M. Crockett, chief fire department.	Patrick F. Fitzgerald.
Millbury,	124	William E. Horn,	Edward F. Roach.
Millis,	253	Chas. La Croix,	Fred Holland.
Milton,	242	Nathaniel T. Kidder, park commissioner.	Nathaniel T. Kidder.
Monroe,	34	S. R. Tower,	– –
Monson,	98	Omer E. Broadway,	– –
Montague,	53	Fred W. Lyman, lumber dealer,	– –
Monterey,	28	Andrew J. Hall,	– –
Montgomery,	82	Frank C. Preston, P. O Huntington,	– –
Mt. Washington,	30	Fred Porter,	– –
Nantucket,	333	Albert R. Coffin,	– –
Nahant,[1]	–	– – –	Thos. Roland.
Natick,	204	William E. Daniels,	H. H. Hunnewell.
Needham,	238	Howard H. Upham, captain fire department.	Ernest E. Riley.
New Ashford,	6	Wm. E. Baker,	– –
New Bedford,	277	Edward F. Dahill, chief fire department.	– –
New Braintree,	131	E L. Haven,	– –
New Marlborough,	32	Dennis Hayes, P. O. Mill River,	– –
New Salem,	55	Rawson King, P. O. Cooleyville,	– –
Newbury,	231	William P. Bailey.	O. B. Tarbox.
Newburyport,	230	David Kent, 26 Arlington Street,	Charles P. Kelley.
Newton,	205	Walter B. Randlett, chief fire department, P. O. West Newton.	Chas. J. Bucknam.
Norfolk.	256	C. Albert Murphy,	C. Albert Murphy.
North Adams,	4	H. J. Montgomery, chief fire department.	– –
North Andover,	215	Geo. A. Rea,	Peter Holt.
N. Attleborough,	262	Harvey W. Tufts, chief fire department,	F. P. Toner.
N. Brookfield,	129	H. S. Lytle, chief fire department,	– –
N. Reading,	175	Irving F. Batchelder,	Geo. E. Eaton.
Northampton,	72	Frederick E. Chase,	– –
Northborough,	140	T. P. Haskell,	T. P Haskell.

[1] No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

Town or City.	Badge No.	Forest Warden.	Local Moth Superintendent.
Northbridge,	117	W. E. Beemap, P. O. Whitinsville,	Arthur F. Whitin.
Northfield,	40	Fred W. Doane,	– –
Norton,	266	Alden G. Walker,	– –
Norwell,	290	John Wahlen,	John H. Sparrell.
Norwood,	250	J. Fred Boyden, chief fire department,	H. Frank Winslow.
Oak Bluffs,	334	Samuel N. Kidder,	– –
Oakham,	135	Chas. H. Trowbridge,	– –
Orange,	47	Chas. E. Lane,	– –
Orleans,	321	Chas. F. Poor,	Albert A. Smith.
Otis,	27	Wilbur L. Strickland,	– –
Oxford,	335	A. W. Stafford, North Oxford,	Chas. G. Larned.
Palmer,	89	James Summers, chief fire department, P. O. Box 333.	C. H. Keith.
Paxton,	130	Geo. W. Van Wyke,	– –
Peabody,	219	Michael V. McCarthy, Forest Street,	James F. Callahan.
Pelham,	68	E. P. Bartlett, P. O. Amherst,	– –
Pembroke,	294	Jos. J Shepherd,	Calvin S. West.
Pepperell,	160	Geo. G. Tarbell, P. O. East Pepperell, Room 17, Aldine block.	John Tune.
Peru,	16	Clarence W. Hathaway,	– –
Petersham,	148	George P Marsh,	– –
Phillipston,	106	William Cowbleck, Athol, R. F. D. No 3.	– –
Pittsfield,	13	Lucien D. Hazard,	– –
Plainville,	59	J. F. Thompson,	E. C. Blackwell.
Plainfield,	309	Lestan E. Parker,	– –
Plymouth,	302	Herbert Morissey,	Geo. R. Briggs.
Plympton,	300	Thomas W Blanchard,	Zina E. Sherman.
Prescott,	69	Waldo H. Pierce, P. O. Greenwich Village.	– –
Princeton,	150	J. Heyden Stimpson,	J. Harry Allen.
Provincetown,	325	James H. Barnett,	– –
Quincy,	243	Peter J. Williams, chief fire department.	Randolph C. Bainbridge.
Randolph,	248	Chas. A. Wales, chief fire department,	James E. Blanche.
Raynham,	270	John V. Festing,	Geo. M. Leach.
Reading,	176	Herbert E. McIntire,	Guy A. Hubbard.
Rehoboth,	268	Silas A. Pierce,	– –
Revere,[1]	–	– – –	George Babson.
Richmond,	17	T. B. Salmon,	– –
Rochester,	282	William N. Smellie,	– –

[1] No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

Town or City.	Badge No.	Forest Warden.	Local Moth Superintendent.
Rockland,	288	John H. Burke, water commissioner,	Frank H. Shaw.
Rockport,	235	A. J. McFarland, P. O. Box 91,	Eli Gott.
Rowe,	35	Merritt A. Peck,	– –
Rowley,	232	Daniel O'Brien, agent Gypsy Moth Commission.	Daniel O'Brien.
Royalston,	102	Willard W. White, P. O. South Royalston.	– –
Russell,	83	Sidney F. Shurtleff, highway surveyor,	– –
Rutland,	143	Henry Converse, chief fire department,	– –
Salem,[1]	–	– – –	Amos Stillman.
Salisbury,	229	Wm. H. Evans,	Chas. M. Pike.
Sandisfield,	33	Lyman H. Clark, P. O. New Boston,	– –
Sandwich,	314	John F. Carlton, P. O. Spring Hill,	B. F. Denison.
Saugus,	207	Ole C. Christiansen,	Thos. E. Berrett
Savoy,[1]	8	Herbert H. Fitzroy, P. O. Savoy Center.	– –
Scituate,	291	John F. Turner, tree warden,	Percival S. Brown.
Seekonk,	267	John L. Barker, P. O. Attleborough, R. F. D. No. 4.	– –
Sharon,	251	John G. Phillips,	T. J. Leary.
Sheffield,	31	Geo. G. Peck,	– –
Shelburne,	43	H. O. Fisk, P. O. Shelburne Falls,	– –
Sherborn,	203	Milo F. Campbell, constable, South Sherborn.	J. P. Dowse.
Shirley,	168	Melvin W. Longley, assessor,	A. A. Adams.
Shrewsbury,	132	Wm. E. Rice,	Frank L. Ott.
Shutesbury,	58	Emmons J. Spear,	– –
Somerset,	336	James Wilson, fish and game warden,	– –
Somerville,[1]	–	– – –	Asa B. Pritchard.
South Hadley,	78	Joseph Beach, P. O. South Hadley Falls.	– –
Southampton,	76	Geo. W. Tyler,	– –
Southborough,	337	Harry Burnett, tree warden,	Harry Burnett.
Southbridge,	109	Aimee Langevin, Olney Avenue,	– –
Southwick,	92	Edward Gillett, tree warden,	– –
Spencer,	121	A. F. Howlett,	– –
Springfield,	86	Burton Steere, assistant fire chief,	Wm. F. Gale.
Sterling,	144	G. F. Herbert, assessor,	– –
Stockbridge,	21	Geo. Schneyer, selectman, P. O. Glendale.	– –
Stoneham,	190	Geo. E. Sturtevant, chief fire department.	Geo. M. Jefts.
Stoughton,	258	Jesse E. Smith,	Wm. P. Kennedy.
Stow,	183	William H. Parker, P. O. Gleasondale,	J. Frank Robbins.

[1] No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

Town or City.	Badge No.	Forest Warden.	Local Moth Superintendent.
Sturbridge,	108	Chas. M. Clark, P. O. Fiskdale,	– –
Sudbury,	185	F. E Bent,	Wm. E. Baldwin.
Sunderland,	338	A. C. Warner,	– –
Sutton,	116	Ransom W. Richardson,	John E. Gifford.
Swampscott,	339	Geo. P. Cahoon, fire chief department,	Geo. Newhall.
Swansea,	273	Thos. L. Mason, constable, P. O. R. F. D. No. 2.	– –
Taunton,	269	Fred A. Leonard, chief fire department, School Street.	Alvaro Harnden.
Templeton,	107	Henry H. Seaver, P. O. Baldwinville,	John B. Wheeler.
Tewksbury,	164	Herbert W. Pillsbury,	Harry M. Briggs.
Tisbury,	310	Albert Rotch, P O. Vineyard Haven,	– –
Tolland,	90	Eugene M. Moore,	– –
Topsfield,	218	Isaac B. Young, selectman,	C. W. Floyd.
Townsend,	159	F. J. Piper, chief fire department,	Geo. E. King.
Truro,	324	Naylor Hatch,	Joseph H. Atwood.
Tyngsborough,	162	Otis L. Wright,	Howard E Noble.
Tyringham,	26	Geo. F Knapp,	– –
Upton,	126	Geo. Z. Williams, chief fire department,	Geo. H. Evans.
Uxbridge,	113	Arnold S. Allen, constable and chief fire department.	– –
Wakefield,	208	Samuel T. Parker,	W W. Whittredge.
Wales,	100	W. W. Eager,	– –
Walpole,	340	N. Emmons Winslow, chief fire department.	Philip R. Allen.
Waltham,	195	Geo. L. Johnson, chief fire department,	Jesse M. French.
Ware,	75	L. S. Charbonneau, P. O. Box No. 25,	– –
Wareham,	305	Arthur B. Savary,	J. J. Walsh.
Warren,	119	Joseph St. George, constable,	Alfred A. Warriner.
Warwick,	41	Chas. H. Williams,	– –
Washington,	19	Geo. Messenger, R. F. D., Becket,	– –
Watertown,	206	John C. Ford, tree warden,	John C. Ford.
Wayland,	196	Clarence S. Williams, Cochituate,	Daniel Graham.
Webster,	111	Arthur B. Patterson,	– –
Wellesley,	239	Fletcher M. Abbott, tree warden,	Fletcher M. Abbott.
Wellfleet,	323	Edwin P. Cook,	Everett S Jacobs.
Wendell,	54	Geo. A. Lewis,	– –
Wenham,	221	Jacob D. Barnes, tree warden,	Jacob D. Barnes.
West Boylston,	137	Frank H. Baldwin, agent Metropolitan Water Board.	– –
West Bridgewater,	285	Octave Belmore, tree warden,	Octave Belmore.
West Brookfield,	128	Robert M. Carter, P. O, Box 135.	– –

List of Forest Wardens and Local Moth Superintendents — Con.

Town or City.	Badge No.	Forest Warden.	Local Moth Superintendent.
Westborough,	133	James H. McDonald, chief fire department.	Walter Sullivan.
West Newbury,	226	Silas M. Titcomb, P. O. Byfield,	Robert J. Forsyth.
West Springfield,	341	A. A. Sibley,	– –
West Stockbridge,	20	Bernard Manning,	– –
West Tisbury,	307	William J. Rotch,	– –
Westfield,	84	Geo. H. Byers, chief fire department, P. O. address, Arnold Street.	– –
Westford,	166	John A. Healey, P. O. Graniteville,	Harry L. Nesmith.
Westhampton,	71	Levi Burt,	– –
Westminster,	154	John C. Goodridge, chief fire department.	Stillman Whitney.
Weston,	186	Edward P. Ripley,	Edward P. Ripley.
Westport,	279	Frank Whalon, North Westport,	– –
Westwood,	251	E. E. Smith, P. O. Islington,	C. H. Southerland.
Weymouth,	245	J. Rupert Walsh, P. O. East Weymouth.	Dummer Sewall.
Whately,	56	James A. Wood,	– –
Whitman,	297	Clarence A. Randall, tree warden,	Clarence A. Randall.
Wilbraham,	96	Henry I. Edson, P. O. North Wilbraham.	– –
Williamsburg,	64	Howard C. Pomeroy,	– –
Williamstown,	2	Daniel Hogan,	– –
Wilmington,	174	Jos. M. Hill, chief fire department, P. O. North Wilmington, P. O. Box 24.	Oliver A. McGrane.
Winchendon,	103	Arthur L. Brown, chief fire department.	– –
Winchester,	189	Irving L. Symmes, chief fire department.	Samuel S. Symmes.
Windsor,	12	H. Ward Ford, tax collector,	– –
Winthrop,[1]	–	– – –	Frank W. Tucker.
Woburn,	177	Frank E. Tracy, chief fire department,	John H. McGann.
Worcester,	131	H. Ward Moore, Winnefred Avenue,	J. H. Hemingway.
Worthington,	62	Chas. E. Clark,	– –
Wrentham,	260	Chas. E. Brown, chief fire department,	Wm. M. Gilmore.
Yarmouth,	316	Seth Taylor, constable,	Chas. R. Bassett.

New Legislation.

The new legislation enacted by the last General Court on forestry matters was as follows: —

1. An act relative to the liability of railroads for the extinguishment of forest fires.

2. An act empowering the Governor of the Commonwealth

[1] No forest area.

to issue a proclamation for a closed season for game during times of drouth.

3. Amended law, extending the area in one tract from 40 to 80 acres in lands purchased by the State for reforestation.

4. An act placing the work of suppressing the gypsy and brown-tail moths under the State Forester.

5. Appropriation for gypsy and brown-tail moth work.

6. An act to encourage the growth of white pine timber.

1. An Act relative to the Liability of Railroads for the Extinguishment of Forest Fires.

The enactment of this bill makes the railroads liable not only for the damage resulting from a fire caused by them, but for the expense of extinguishment of the fire. This act at first might seem to work hardship on railroads, as it was shown last year that 43 per cent. of the fires set in the State were railroad fires. With our new forest warden law, however, it is believed by both the State Forester and the railroad officials that with a perfected system of fire fighting the railroads themselves will gladly reimburse the towns and cities for the expense of extinguishing fires set by them, believing that by so doing the real damage to property will be thus lessened, and in the outcome not only will the railroads themselves be the gainers financially, but the towns and cities, in that less acreage is likely to be burned.

The act is as follows: —

ACTS OF 1909, CHAPTER 394.

AN ACT RELATIVE TO THE LIABILITY FOR THE EXTINGUISHMENT OF FOREST FIRES.

Be it enacted, etc., as follows:

SECTION 1. Any railroad corporation which, by its servants or agents, negligently, or in violation of law, sets fire to grass lands or forest lands shall be liable to any city or town in which such fire occurs, for the reasonable and lawful expense incurred by such city or town in the extinguishment of the fire.

SECTION 2. Cities and towns may recover sums to which they are entitled under the provisions of this act by an action of contract in the superior court. [*Approved May 14, 1909.*

2. An Act empowering the Governor of the Commonwealth to issue a Proclamation for a Closed Season for Game in Times of Drouth.

This is a precautionary measure that will result in calling the attention of the public to the importance of being careful about fires at a time when attention is most needed.

The act is as follows: —

ACTS OF 1909, CHAPTER 422.

AN ACT TO AUTHORIZE THE GOVERNOR TO PROCLAIM A CLOSE SEASON FOR GAME IN TIMES OF DROUTH.

Be it enacted, etc., as follows:

SECTION 1. Whenever, during an open season for the hunting of any kind of game in this state, it shall appear to the governor that by reason of extreme drouth the use of firearms in the forest is liable to cause forest fires, he may, by proclamation, suspend the open season and make it a close season for the shooting of birds and wild animals of every kind for such time as he may designate, and may prohibit the discharge of firearms in or near forest land during the said time.

SECTION 2. During the time designated as above by the governor, all provisions of law relating to the close season shall be in force, and whoever violates any such provision shall be subject to the penalties prescribed therefor. In case any person shall, during a close season proclaimed as aforesaid, discharge a firearm in or near forest land, or shoot any wild animal or bird, as to which there is no close season otherwise provided by law, he shall be subject to a fine of not more than one hundred dollars.

SECTION 3. A proclamation issued under authority hereof shall be published in such newspapers of the state and posted in such places and in such manner as the governor may direct, under the charge and direction of the state forester and the commissioners on fisheries and game. [*Approved May 21, 1909.*

3. Revised Law extending the Area in One Tract from 40 to 80 Acres in Lands purchased by the State for Reforestation.

The restriction to 40 acres was found to necessitate the expense of an extra survey where the lots ran slightly over the limited number, and by placing the area at 80 acres this objection is eliminated.

The act is as follows: —

Acts of 1909, Chapter 214.

An Act relative to the Purchase by the State Forester of Land adapted to Forest Production.

Be it enacted, etc., as follows:

Section 1. Section one of chapter four hundred and seventy-eight of the acts of the year nineteen hundred and eight is hereby amended by striking out the words "forty acres", in the tenth line, and inserting in place thereof the words: — eighty acres, — so as to read as follows: — *Section 1.* For the purpose of experiment and illustration in forest management and for the purposes specified in section seven of this act the sum of five thousand dollars may be expended in the year nineteen hundred and eight, and the sum of ten thousand dollars annually thereafter, by the state forester, with the advice and consent of the governor and council, in purchasing lands situated within the commonwealth and adapted to forest production. The price of such land shall not exceed in any instance five dollars per acre, nor shall more than eighty acres be acquired in any one tract in any one year, except that a greater area may so be acquired if the land purchased directly affects a source or tributary of water supply in any city or town of the commonwealth. All lands acquired under the provisions of this act shall be conveyed to the commonwealth, and no lands shall be paid for nor shall any moneys be expended in improvements thereon until all instruments of conveyance and the title to be transferred thereby have been approved by the attorney-general and until such instruments have been executed and recorded.

Section 2. This act shall take effect upon its passage. [*Approved March 25, 1909.*

4. *An Act placing the Work of suppressing the Gypsy and Brown-tail Moths under the State Forester.*

The enactment of this law was the result of its recommendation by Governor Draper in his inaugural address.

The act is as follows: —

Acts of 1909, Chapter 263.

An Act to provide for consolidating the Office of Superintendent for suppressing the Gypsy and Brown Tail Moths and the Department of the State Forester.

Be it enacted, etc., as follows:

Section 1. Section one of chapter four hundred and nine of the acts of the year nineteen hundred and four, as amended by section one of chapter four hundred and seventy-three of the acts of the year

nineteen hundred and seven, is hereby further amended by striking out the said section and inserting in place thereof the following: — *Section 1.* The governor, with the consent of the council, shall appoint an officer to be known as the state forester, and shall determine his salary. He shall be a trained forester who has had a technical education. He shall be ex officio a member of the state board of agriculture. He shall act for the commonwealth in suppressing the gypsy and brown tail moths as public nuisances. The governor may, with the consent of the council, remove the state forester at any time for such cause as he shall deem sufficient. In case of the death, removal or resignation of the state forester the governor shall forthwith appoint a successor.

Section 2. The office of superintendent for suppressing the gypsy and brown tail moths is hereby abolished. All the powers, rights, duties and liabilities of the said superintendent are hereby transferred to the state forester. No existing contracts, proceedings or liabilities shall be affected hereby, but the state forester shall in all respects and for all purposes be the lawful successor of the superintendent for suppressing the gypsy and brown tail moths.

Section 3. This act shall take effect upon its passage. [*Approved April 7, 1909.*

5. *An Act to provide Funds for carrying on the Moth Work during a Definite Period of the Year, so that the Effect of the Work will not be handicapped.*

The act is as follows: —

Acts of 1909, Chapter 452.

An Act to provide for the Suppression of the Gypsy and Brown Tail Moths.

Be it enacted, etc., as follows:

Section 1. The state forester is hereby authorized to expend for the suppression of the gypsy and brown tail moths, and for expenses incidental thereto, the sum of one hundred and fifty thousand dollars annually for three years, beginning with the year nineteen hundred and ten; and if any part of the said one hundred and fifty thousand dollars remains unexpended at the close of any year the balance may be expended in the following year.

Section 2. This act shall take effect upon its passage. [*Approved May 26, 1909.*

6. An Act to encourage the Growth of White Pine Timber.

This bill was enacted in order to encourage land owners to leave seed trees and encourage natural methods of reforestation.

It offers as a premium exemption from taxation for a certain period of all lands that are properly restocked to white pine.

ACTS OF 1909, CHAPTER 187.

AN ACT TO ENCOURAGE THE GROWTH OF WHITE PINE TIMBER.

Be it enacted, etc., as follows:

SECTION 1. Land which does not exceed in value ten dollars an acre, if well stocked with thrifty white pine seedlings that have attained an average height of not less than fifteen inches, upon satisfactory proof of its condition by the owner to the assessors, shall be exempt from taxation for a period of ten years thereafter: *provided,* that if any trees of commercial value, except such as are reasonably removed for the improvement of the white pine growth, are cut or removed from the said land, the exemption herein provided for shall cease.

SECTION 2. All acts and parts of acts inconsistent herewith are hereby repealed.

SECTION 3. This act shall take effect upon its passage. [*Approved March 18, 1909.*

ACKNOWLEDGMENTS.

It is with pleasure that the State Forester acknowledges the valuable services and loyal support which he has received through his corps of assistants, not only in the office but in the field, throughout the year.

Mr. L. Howard Worthley has been untiring in his efforts to leave nothing undone in his assistance in perfecting the organization of the moth work and in getting the best possible results.

Mr. H. O. Cook, M.F., has kept up the high standard in technological lines, and, as the reports show, has increased the efficiency of the work in forestry management beyond that of any previous year.

Mr. R. S. Langdell, who has charge of the nursery work, has not only demonstrated that this work is a commercial success, but has penetrated every section of the State, and is largely responsible for the splendid beginning already made in reforestation.

Mr. Chas. O. Bailey has loyally stood at his post of duty as secretary, and kept the machinery well oiled and properly running.

The State Forester is under obligation, for courteous treatment and kindly consideration, to all citizens, boards and officials with whom he has come in contact, and especially to Dean W. C. Sabine of Harvard University, Dr. L. O. Howard of the United States Bureau of Entomology, and his predecessor, A. H. Kirkland, for kindly assistance, suggestions and advice. He wishes also to acknowledge the great assistance rendered by the men of the co-operative scientific staff.

Part I.

GENERAL FORESTRY.

Part I.

GENERAL FORESTRY.

Examination of Woodlands and Practical Assistance given Owners.

This department of our forestry work is the largest establishment of all our lines, yet it is not as familiar to the people of the State as it should be. If it were, we believe that there would be many more calls for advice than we receive at present. By examinations we refer briefly to this, that owners of woodland in the State may, by applying to this office on a special blank, have a trained forester come and look over their woodland, and he will point out to them how it can be improved, and furnish any other information which it is in his power to give. Where it is a case of thinning, he may, if he sees fit, mark a portion of the trees to be cut. The only expense to the owner for this advice is the travelling expenses of the visiting forester. This offer applies equally to land owners who want advice on the planting of barren land. Counsel given on the ground, where all the conditions can be seen and met, is far superior to any given by correspondence or to the general advice contained in pamphlets.

The following table shows the number of examinations made in this and past years, together with the combined area of the various wood lots. It will be noticed that there is a slight falling off since last year; but this fact does not discourage us, because in 1908 we made a special effort to advertise this part of our work, first by sending out a large number of examination application blanks to those on our mailing list, and second, by sending a special circular letter to all the water boards in the State. The result was, of course, that quite a number of requests for assistance were received which otherwise would not have been made, including some of our largest. Holding that the figures of last year were abnormal, we consider those of this

year to be distinctly encouraging; yet, as we have said before, we think that there should be more use made of this offer on the part of the State of free forestry advice.

	1904. (6 mos.)	1905.	1906.	1907.	1908.	1909.
Number,	14	36	47	37	65	60
Total area,	2,000	6,545	9,357	8,713	15,842	15,862

As was done last year, a circular letter with an accompanying set of questions was sent to those who received advice during 1908, the object of which was to ascertain how far the recommendations made by the visiting forester had been carried out. A larger percentage of replies was received than last year, there being 46 who sent in reports, to 12 who did not. Eight were not given blanks, as enough was known of their work, through other channels, to make further information unnecessary. The following table gives a summary of these reports: —

Reports received from Examiners of 1908.

Recommended to thin: —	
All the work done,	8
Partly done,	13
Nothing done,	10
Recommended to plant: —	
All the work done,	2
Partly done,	13
Nothing done,	15
Recommended to do nothing,	4
Clean cutting recommended,	2

Results of Examinations of 1907.

Recommended to thin: —	
All the work done,	3
Partly done,	6
Nothing done, or not reporting,	8
Recommended to plant: —	
All the work done,	2
Partly done,	10
Nothing done, or not reporting,	8
Recommended to do nothing,	4

A white pine plantation on the watershed of the Wachusett reservoir, near Clinton.

A mixed white pine and hard-wood plantation, five years after setting. The hard woods are not a success.

Contrary to results in 1907, thinning work in 1908 seemed to be more popular than planting. This may be due in part to the fact that we have endeavered to mark a portion of the trees to be cut.

For a record of the work done, see list under forestry expenditures and receipts.

Reforestation Work.

Great interest has been shown in regard to reforesting the waste and denuded lands of the Commonwealth. The reforestation law of 1908 fills to a large extent a long-felt want in this line of work, and, although the State planting is necessarily limited by the appropriation, it is desired as far as possible to plant one or more lots in each town in the State. This will place before the people an example which private owners can follow out in their own work, and in time bring much of the lands generally considered worthless and an eyesore to the community back into a profitable forest growth.

Land referred to as fit only for reforesting purposes can be classed under the following types: cut-over land, burnt-over land, and run-out pasture land (growing up to gray birch, etc.). The land taken over under this act generally comes under one of the foregoing types.

The first of the year a notice and copy of the acts were sent to the selectmen, forest warden and the leading newspapers in each town. From applications desiring to take advantage of the act, deeds for 929 acres of land have been recorded and the tracts planted last spring. For this purpose 500,000 three-year-old white pine transplants were obtained from German nurseries, and as many more seedlings from this country, a portion of the latter being sent out from the State nursery at Amherst.

The different lots were planted by local workmen in the towns, under the supervision of experienced foresters from this office. The average cost of planting this year ranges from $6 to $10 per acre; but by raising our own trees in a nursery established for the purpose the cost could be greatly reduced.

In a few instances it was deemed advisable to cut a fire belt on the exposed side of the plantation, to act as a protection from

forest fires, which are the chief danger and drawback to setting out trees to be grown for a term of years.

The coming year land in other sections will be planted, and it is hoped plantations will become quite generally distributed throughout the State.

The following plantations were made in the towns named during the past year: —

STATE PLANTATIONS.

Town.	Acres	Type of Land.	Variety planted.
Andover,	40	Cut and burnt land,	White pine.
Ashburnham,	66	Run-out pasture	White pine.
Ashburnham,	10	Run-out fields,	White pine.
Ashburnham,	5	Old orchard,	White pine.
Carver,	5	Burnt-over land,	White pine.
Gardner,	93	Burnt-over land,	White pine.
Hubbardston,	54	Sandy plain land,	White pine.
Hubbardston,	40	Plains land,	White pine.
Hubbardston,	40	Cut and burnt land,	White pine.
Hubbardston,	14	Cut-over land,	White pine.
Hubbardston,	10	Cut-over land,	White pine.
Kingston,	10	Burnt-over land,	White pine.
Montague,	26[1]	Plains land,	White pine.
Paxton,	55	Cut-over land,	White pine.
Pelham,	16	Cut-over hillside,	White pine.
Pelham,	6	Cut-over land,	White pine.
Rowley,	10	Cut-over land,	White pine.
Sandwich,	14	Cut-over land,	Scotch and Austrian pine.
Spencer,	35	Cut and burnt land,	White pine.
Spencer,	23	Run-out pasture,	White pine.
Spencer,	6	Cut-over land,	White pine.
Templeton,	107[1]	Cut-over land,	White pine.
Templeton,	60[1]	Cut-over land,	White pine.
Westminster,	40	Cut-over land,	White pine.
Westminster,	40	Cut-over land,	White pine.
Westminster,	39	Burnt-over land,	White pine.
Westminster,	36	Cut-over land,	White pine.
Westminster,	29	Cut-over land,	White pine.
Total area,	927		

[1] Lots protected by fire belt.

Planting done under Advice of State Forester.

Name.	Town.	Variety.	No. of Trees.
Amherst Water Company,	Amherst,	White pine,	10,000
Holyoke Water Company,	Holyoke,	White pine,	10,000
Leominster Water Company,	Leominster,	White pine,	7,000
Westfield Water Company,	Westfield,	White pine,	7,000
Harlow Brook Cranberry Company,	Wareham,	White pine,	5,000
Fred Barclay,	Spencer,	White pine,	12,000
Lewis I. Wright,	Gardner,	White pine,	2,000
E. E. Rice,	Boston,	White pine,	1,000
D. H. Rice,	Barre,	White pine,	2,000
N. D. Bill,	Springfield,	Chestnut,	500
E. P. Dunbar,	West Bridgewater,	White pine,	4,000
A. H. Hall,	Leominster,	White pine,	1,000
Brown Bros. and John Folsom,	Winchendon,	White pine,	50,000

Evergreen Seedlings now imported Free of Duty.

It may be of interest to know that the last session of Congress removed the duty on evergreen seedlings. This places the reforestation work with evergreens on a practical basis. Our people will ultimately grow their own stock, and the foreign importation will keep prices within bounds until that time. The tariff heretofore was $1 per 1,000, and 15 per cent. ad valorem.

Forest Nursery.

The State forest nursery at Amherst on the farm of the Agricultural College was again enlarged last spring, and we have prospects of being able to use at least 1,200,000 white pine two-year-old trees of our own growing in the reforestation work throughout the State next spring. Besides white pine we also have many other species in lesser lots, but all of value in the State work. The detailed table which follows may be of interest. The State forest nursery work speaks for itself, when we show that the total expense of carrying it on has been for three years $5,749.69, and were we to sell the stock now on hand at current prices it would be worth $7,500.

Meanwhile, we have been using seedlings and transplants

every year which are not included here. Last spring alone we dug from the nursery at least 150,000 trees, and at present we have fully 2,000,000 one-year-old white pine seedlings, besides 100,000 of other species. The following table shows the estimated amount of nursery stock on hand: —

Variety.	Age (Years).	No. of Trees.
White pine seedlings,	2	1,200,000
White pine seedlings,	1	2,000,000
Pitch pine seedlings,	2	40,000
Pitch pine seedlings,	1	50,000
Norway pine seedlings,	1	5,000
Austrian pine seedlings,	1	2,000
Norway spruce seedlings,	1	25,000
Balsam fir seedlings,	1	5,000
Hemlock seedlings,	1	5,000
Red spruce seedlings,	1	2,000
Black locust seedlings,	1	5,000
Total,		3,339,000
White pine transplants,	4	25,000
White pine transplants,	3	25,000
White ash transplants,	2	20,000
Norway spruce transplants,	3	3,000
Black locust transplants,	2	2,000
Catalpa speciosa transplants,	2	300
Honey locust transplants,	2	6,000
Total,		81,300

It has been the aim of the State Forester not only to demonstrate in the nursery what can be done, but to assist those interested in growing their own trees by sending literature describing how to collect the seed, and even furnishing an assistant to demonstrate how to make the seed beds and plant the seeds. During the planting season at the nursery we are glad to welcome any one desiring experience in nursery work. This offers an opportunity not only to see how the work is performed, but to get some actual experience. Last spring several persons availed themselves of this offer.

A few persons have started seed beds of their own. One man will have 150,000 two-year-old seedlings to use from his own growing next spring, while another estimates he will have from 250,000 to 350,000. Many more will have smaller lots.

Larger State Nursery needed.

The time has come when the State should have a more definite forest nursery policy. It is deemed practically necessary that the State operate a nursery of sufficient size to raise its own trees for reforestation purposes under the reforestation act. It is believed the State Forester will be unable to secure sufficient suitable land in large enough area on the farm of the Agricultural College to carry on the work necessary. The college already feels cramped for land, and the small tract used for the present nursery, which is altogether inadequate for the needs of the coming year, is allowed us only temporarily. If the college trustees feel unable to allow the State Forester double the area where the present nursery is located, it will necessitate making plans elsewhere. A water supply should be put in, more screens made and a better work shed built. The nursery should also be fenced off, as damage has repeatedly resulted from animals getting loose and trampling the beds. These improvements will be necessary, whether we remain at the college or move the nursery elsewhere.

The State Forester should be given sufficient funds for establishing a nursery commensurate with the carrying out of the reforestation act, for, as already demonstrated, it amounts only to lending the money to carry on work that will be returned to the State treasury later in the sale of forest products.

New York State last year published a bulletin offering forest tree seedlings and transplants from the State forest nursery to any one who would guarantee to plant them in that State, at the following prices: —

White pine transplants, ...	$4.25 per 1,000, f.o.b.
White pine seedlings (2 years old), . . .	2.25 per 1,000, f.o.b.
Scotch pine transplants, ...	3.75 per 1,000, f.o.b.
Scotch pine seedlings, ...	2.25 per 1,000, f.o.b.

While the State of New York was encouraging its people in reforestation by the above generous offer, Massachusetts was unable to purchase similar white pine seedlings for less than $4 per 1,000 in this country, and even at that price we were compelled to take them in 100,000 lots; for 1,000 lots the price was $5 per 1,000 for the best and $4 for second quality. Transplants of white pine were quoted at from $10 to $20 per 1,000.

If New York can do this, and make the work self-supporting, I feel sure that under similar conditions Massachusetts can do as well.

As was stated last year, it is not the intention of the State to go into the nursery business, other than to meet requirements in carrying out a practical economic reforestation policy. If we can grow seedlings and pay all expenses for $2.25 per 1,000, why should we be compelled to pay $5 ? Using, as we will the coming spring in the State reforestation work, 2,000,000, the cost if grown by ourselves would not exceed $4,500, while in the American markets they would cost us $8,000 if purchased in large lots, or $10,000 if purchased in smaller quantities.

While the difference in white pine seedlings seems large, transplants are comparatively more expensive, the one being $4.25 per 1,000 as compared to $12.

Norway Spruce as a Forest Tree.

This tree is used quite commonly as an ornamental tree in this State, and common observation shows that it succeeds remarkably well. As a possible forest tree it has not been considered very seriously until this year. It is believed that the Norway spruce will succeed where our native spruces are found growing naturally, and perhaps elsewhere. The following experience of Mr. George Aiken, manager of the Billings Farm at Woodstock, Vt., in growing Norway spruce on his farm, is herewith offered, with his permission.

One acre was planted with three-year-old trees, 8 feet apart each way, requiring 680 trees to the acre. The land was a poor, sandy hillside, unfit for cultivation. In 1908, when the trees were thirty-two years of age, or thirty-five years from seed, 4 average-sized trees were cut. Their measurements were as follows: —

A large tract of land in Hubbardston, which was reforested by the department last spring.

A portion of one of the lots turned over to the State. The cord wood taken out pays the expense, and the remaining stand is in a much-improved condition.

No. 1, 72 feet high, 11-inch butt cut, 46½ feet of logs 6 inches at top.
No. 2, 57 feet high, 15-inch butt cut, 47½ feet of logs 6 inches at top.
No. 3, 63 feet high, 14-inch butt cut, 42 feet of logs 6 inches at top.
No. 4, 67 feet high, 16-inch butt cut, 40 feet of logs 6 inches at top.

These 4 trees produced 1 cord of pulp wood. Reckoning from this yield as applied to an acre, the yield would be 172½ cords, which at the current price of $6.50 per cord, would give the income from this acre $1,120 in thirty-two years.

Computing the land at $5 per acre, cost of trees and planting at $5, and to this adding compound interest for the thirty-two years, the total would amount to $65.50; adding to this taxes for thirty-two years, or $7.50, makes the total investment $73, and hence leaves a net income of $1,046.86, or a yearly average of $36.72 per acre. Mr. Aiken claims that this land is not worth over 50 cents per acre per annum for grazing.

The pulp wood cut here was sold to the International Paper Company, who made it into paper at the Bellows Falls mill. Mr. Edward Barrett, superintendent of this mill, reports as follows: —

The Norway Spruce Test. — One cord of rough wood, 71 sticks 4 feet long, after preparing for grinding room, gave us 98 cubic feet; this made 1,228 pounds of dry wood pulp. The spruce worked nicely on the paper machine, and, under the same conditions as our regular spruce, gave us a higher test for strength and a brighter shade with the same amount of color.

For the first time the State Forester expects to set out quite a large number of Norway spruce in Massachusetts the coming spring. The beauty of the spruce for pulp wood is that practically the whole tree is utilized.

Forest Fires of 1909.

Forest fires have been altogether too numerous throughout the State during the past season. We are convinced that the permit act which went into effect last spring gave splendid results, and that forest wardens generally were more active than ever; but with all this we are not accomplishing the results we should and must.

The total number of forest and grass fires reported to the State Forester during the year was 1,531; the number of acres burned over, 42,808; loss to the State, $236,478.

From the table it is shown that the chief cause of forest fires is from railroad locomotives, which set 497, or 34 per cent. of the total of the year, compared with 490 last year. Next in point of number are fires from unknown causes, 360. The third largest cause is due to burning brush, 108, or 7½ per cent. of the total. The fourth in number is that caused by smokers, 90. It is believed, however, that in the latter should be included the great number of those listed under the unknown, and even some of those attributed to other causes. The fifth cause was directly traceable to our juvenile population, as 83 were known to be set by boys.

It is hoped that our railroads will exert themselves to lessen these fires in the coming year. We certainly should ascertain the causes unknown at present, and, with our permit law in force, the burning brush cases should be very much reduced; while the number of fires caused by smokers and boys will be overcome only by a determination to place the responsibility where it belongs by our forest wardens, deputies and people generally interested in preserving our forests.

Fires from Smoking.

That the careless smoker, who persists in the habit when in woodlands or traversing the country during a dry time, whether at work or play, is the greatest menace to future forestry, it is believed there is little question. The railroad fires are confined to certain areas, but the smoker is everywhere. If forest wardens or their deputies were to bring more circumstantial evidence to bear against smokers from known locations where hunters, fishermen, campers, woodsmen, etc., have traversed, it is believed the effect of the law which makes such persons liable for damages would prove helpful to future forestry.

Causes of Forest Fires in Massachusetts, 1909.

Causes.	No.	Per Cent.
Berry pickers,	25	1.72
Blasting fuse,	1	–
Boys set fire,	83	5.72
Burning brush,	108	7.51
Campers,	9	–
Carelessness,	2	–
Charcoal,	1	–
Children playing,	9	–
Coals dumped,	5	–
Cranberry bogs,	1	–
Electric wires,	2	–
Fire balloons,	1	–
Fireworks and fire crackers,	4	–
Fishermen,	2	–
Grass fires,	30	2.06
Gypsy moth,	6	–
Hunters,	8	–
Incendiary,	36	2.48
Lightning,	1	–
Locomotive sparks,	497	34.26
Mayflower parties,	2	–
Picnic parties,	2	–
Rubbish fires,	31	2.13
Smokers,	90	6.20
Steam saw mills,	5	–
Spark from burning building,	6	–
Spark from forest fire,	11	0.76
Steam roller,	3	–
Scattering,	106	7.33
Unknown,	360	24.89
Wood choppers,	3	–
Reported too late for tabulating,	63	–
Total,	1,513	–

Arrests and Convictions.

Forest wardens have been extremely lenient as regards arrests for violations of the State forest fire laws, — altogether too much so, it is believed. The idea has been to caution people

and educate them in realizing the danger of forest fires before arresting them. It is believed, however, that we have been generous in this respect, and henceforth if we are to stop fires we must be reasonable, but assert a little more backbone in controlling them.

The following arrests and convictions were made during the year 1909: —

Edgartown, July 12. Conviction of man taken while burning without a permit; case placed on file.

Falmouth, June 1. Young man convicted of setting woods fire, and sent to reformatory.

Holbrook, December. Conviction of man burning without a permit; paid fine and costs.

Lancaster, April 2. Man taken while burning without a permit; paid costs and damages.

Mansfield, March 30. Tramp convicted of setting fire to farmer's wood lot; sent to jail.

Plymouth, August 8. Man convicted of burning without a permit; fined $10.

Reading, October 13. Two men burning without permit; fined $25 each.

Spencer, April 10. Man burning without permit; fined $10.

Stoughton, April 7. Man burning without permit; fined.

Tewksbury, July. Boys placed on probation.

Upton. Two men arrested; placed on probation.

Wrentham. Cases on file.

Table of Acres, Cost and Damage, by Months.

Months.	Acres.	Cost.	Damage.	Damage per Acre.
January,	13	–	$20	–
February,	12	–	–	–
March,	1,577	$684	4,763	$3.02
April,	12,515	2,866	72,195	5.76
May,	4,322	1,588	38,080	8.81
June,	405	242	11,870	29.30
July,	11,992	2,715	26,396	2.20
August,	1,940	2,745	10,833	5.57
September,	1,092	562	21,413	19.51
October,	384	180	1,805	5.17
November,	585	356	612	0.61

Table of Forest Fire Totals.

	No. of Fires.	Acres burned.	Cost to put out.	Damage.
Reports received too late for tabulation, .	63	246	$110	$1,515
Totals of reports tabulated for 1909, .	1,450	42,562	15,433	219,425
Forest fire totals for 1909, . .	1,513	42,808	$15,543	$220,930

Railroad Co-operation in Forest Fire Fighting.

During the last year, as heretofore, the officials of the railroads have for the most part shown a very helpful and co-operative spirit in regard to forest fires. More attention has been given to keeping the spark-arresters on engines in order, while our forest wardens and the section men are working together for the prevention of fires. The new legislation of last year, whereby the railroads are to reimburse the towns for the cost of fighting fires known to be set by them, was enacted without any protest, and, in fact, with their consent. Hereby an organization for forest fire fighting is resulting which will prevent fires that otherwise would be of great expense to railroads. The damages for one fire are likely to cost a railroad more than the total expense of reimbursing all of its towns in fighting fires set by them.

President Tuttle of the Boston & Maine Railroad complimented us by having a representative at both the Northampton and Boston conferences of forest wardens, who discussed "What the railroads are doing to prevent fires," and pointed out wherein they were glad to co-operate with the towns in stopping forest and grass fires. The New York, New Haven & Hartford Railroad also sent a representative to the Middleborough meeting in a like capacity. Mr. Louville Curtis, the representative of the Boston & Maine Railroad, has already adopted the use of hand fire extinguishers on the western division of their road, and is delighted with the results. He believes that their use will become very common by railroads for extinguishing forest or grass fires in the future. They could be kept at points along the line easy of access, and quickly shipped by the first train or sent by a special if occasion demanded. Much clearing up

and widening of the right of way have been done by the New York, New Haven & Hartford Railroad throughout the year, particularly in the Cape section.

Forest Fire Deputies needed.

The forest warden law has undoubtedly been tested far enough to be pronounced a success as another step in perfecting our organized efforts against forest fires. I now propose the idea of empowering the State Forester to appoint deputies at large to assist him. Many of our forest wardens need instruction and co-operation in getting their work well in hand. The best way to teach these men just how to accomplish results in fighting forest fires is to confer with them right on the ground, and demonstrate what can be accomplished and how it can be done. There are experienced men whom the State Forester could in times of emergency delegate to assist, and, if need be, with authority to take charge.

In the case of the gypsy and brown-tail moth agents, these men are at present mounted on motor cycles and hence are familiar with the country. They are already State employees, and men interested in the preservation of the forests. They will gladly acquaint themselves with modern methods of fighting forest fires, and, were they appointed deputies authorized to assume responsibility, the State would have their services at no extra compensation. Of course this would apply only throughout the moth-infested territory, but other plans could be worked out for the remainder of the State at a minimum cost.

State Subsidy to Towns for Better Forest Fire Protection.

The time has come when we can ill afford to allow forest fires to run rampant over the State, destroying each year thousands of dollars worth of property.

In many cases the reason for present conditions is that a great many of our rural towns have nothing in the way of equipment with which to fight forest fires when they occur. With a simple equipment, consisting of a few hand chemical fire extinguishers provided with extra charges and loaded into a light one-horse

A photograph, taken after the fire, of a portion of the ten thousand acres burned at Bourne and Falmouth.

The plowed fire line along an old road, which enabled Sandwich to protect the town from the Bourne fire. Bourne on the left, Sandwich on the right.

spring wagon, together with some shovels and hoes, many of the fires could be easily handled before they could do much damage.

Believing, therefore, that the State can afford to encourage the towns to make a definite beginning in stopping forest fires, I recommend the following for your consideration: that the State offer through the State Forester to reimburse towns 50 per cent. of their expenditures for forest fire fighting equipment, or in making forest fire protective belts, to an amount not to exceed $250 for each town thus accepting such aid.

This idea is practically that now in operation by the State in the construction of our State highways, which has proved a great success. The incentive for towns that would otherwise move slowly is apparent.

The total expense, were every town to accept, would amount to but $80,250, — not one-third of the annual loss from forest fires, and with every possibility of the expenditure meaning a saving of ultimate millions in future values to the State.

Plan for establishing Forest Fire Lookouts.

This plan provides for the erection of lookout towers on various high points throughout the State, with the object of detecting and locating forest fires while yet in an incipient stage. The plan is by no means a new one, even in this State, as is evidenced by the towers already in use in Plymouth and Duxbury, and described in the recent fire bulletin issued by this office; while it is generally conceded that the system of towers used by the large timber operators in Maine is one of their most valued assets, since it affords means of preventing fires which would otherwise destroy millions of feet of valuable timber.

But, while the principle and the results are thus similar, the method of application in Massachusetts must necessarily differ greatly from that in Maine. This is because of the different physical conditions of the two States, as we may say; for, while the forest regions of Maine are practically in the central and northern part of the State, and often lie for miles in unbroken tracts, in Massachusetts there are no real forests, properly so-called, and the tracts of woodland that do exist are scattered

over all parts of the Commonwealth, from Cape Cod to the Berkshires, and occur under widely different topographical conditions. And, furthermore, such systems of lookouts as we have mentioned are managed over comparatively localized areas, usually vast wildernesses, by the owners themselves for their own benefit, while the difference in Massachusetts is obvious.

The problem is not to immediately establish a complete fire protection system all over the State, but to endeavor, by placing lookouts at certain important points, to co-operate as far as possible with the local wardens in the quick detection of fires. It is easily seen that such a system becomes useful largely in proportion to the distance covered from a given point, so that a tower erected on flat country may prove of great service. Take, for example, the Plymouth tower. This tower was built by the town of Plymouth, and is of skeleton steel construction somewhat like a windmill tower, with a small sheet-iron cabin at the top. The structure itself is 85 feet high, and the watchman is elevated 250 feet above sea level, — an elevation which enables him to see many miles over the surrounding flat country. A man is kept on watch in this tower in dry seasons from March 15 to October 1, from 8 in the morning till 6 at night. This watchman is connected by telephone with the forest warden, and the plan has proved to be a most excellent one.

The Cape has by far the most destructive fires of any region in the State, and it is therefore thought advisable to lay the strongest emphasis on that section at present, at the same time choosing suitable locations in other sections. At least two towers are urged for the Cape section.

One of the necessary equipments of such stations is the telephone, and the cost of installation would depend, first on whether such hills were already equipped (as is Mt. Greylock); and, second, on the distance to the nearest line and likelihood of future development in the vicinity, which would affect the cost of putting in such a line. In the more remote localities a larger proportion of the expense would have to be borne by the State.

Other equipment consists of good field glasses, range finder and accurate maps of the region. The cost of the structure itself depends, of course, on the locality and the amount of con-

struction necessary. Of 22 stations in Maine, the cost runs anywhere from $350 to $1,000, depending largely on the length of telephone connection. Telephone lines have cost there from $30 to $40 a mile.

One of the large lumber companies owning timber lands in Maine recommends a number of extinguishers on hand at the watch tower for use in case of emergency, and also the maintenance of a patrol during especially dry times.

As regards the expense of maintenance, it seems only fair that it should be borne in part at least by the towns to which protection is given.

Assistant needed in Forest Fire Work.

The time has come when the State Forester should have the assistance of a man who can spend his whole time on forest fire work. For the next few years each town should be visited, and the whole matter of forest fire prevention gone over carefully with the local wardens. Your State Forester cannot get over each of our 321 towns and give them the attention they should have regarding forest fires, and at the same time keep the reforestation, moth work, lectures, correspondence, etc., going. With a competent assistant, however, he can direct the work, and save great values that each year at present are a total loss. Such an assistant could be provided with a motor cycle, by means of which even the most inaccessible country sections could be easily reached. The idea would be to keep this man in the field, particularly during the forest fire season. The expenses of such a man would be his salary and travelling expenses.

Power Sprayers as Forest Fire Equipment.

With the high-power engines and improved pumps on the modern power sprayers, we have an outfit not only adapted to spraying our tallest trees in moth-suppression work, but when properly handled they can be used very effectively for fighting forest fires. While these outfits are rather heavy when loaded, and need a strong team to handle them on the ordinary roads, they may need four horses when operating in woodlands. The advantages of these machines are that they contain a large tank

for water, and also that their power is sufficient so that hose one thousand feet or more in length can be used. In cases where the machines can be placed at the water supply, they can pump directly to the fire.

The following quotation is taken from a letter written to H. L. Frost & Co. by Mr. J. D. Barnes, local superintendent and forest warden, Wenham, Mass.: —

> I also put the machine to a good fire test. Of course we did not purchase this outfit for a fire fighter, but we happened to have a large fire here, where nine ice houses were burning at once. Now, there was a forest across the road from these buildings, also a group of four cottages. I started to save the forest land, not thinking I could do anything about the cottages, but to my surprise we stopped the forest fires and saved the cottages. I started the machine at 4 P.M. and played until 3 A.M., and then started at 7 A.M. and played all day except the noon hour, using two streams of 500 feet of 1-inch hose each, drafting and playing direct. I had to remove the plug in the bottom of the tank to get rid of surplus water, which gained about 400 gallons every forty minutes, which the nozzles could not take care of.

Automobiles and Motor Cycles in Forestry Work.

Upon assuming the duties of the moth work, it was found that the expenditure of a large amount of money in automobile hire would be necessary, as this is the only expedient way of getting into the infested districts and keeping in touch with the field work. It was found that this expense during the previous year had been over $2,000. The matter was taken up with Governor Draper, and he authorized the purchase of an automobile, which has been in constant use. When controversies have arisen in towns or cities over the conditions of the work, we have been able to take the board of selectmen, mayors and others interested directly into the field. It has not been uncommon for the automobile to cover from 10 to 20 towns in a single day, and to do business with as many local superintendents.

The motor cycles were purchased by the department for the division superintendents, and were first used in September. From this short experience we are convinced that the efficiency of each man is greatly multiplied. With a motor cycle he can if need be get into every town under his supervision in one day.

Two motor cycles have also been purchased for the use of the forestry assistants.

I predict even farther that it is only a matter of a short time before our towns will be able to combat forest fires through the assistance of automobiles. Already some of our public-spirited forest wardens have automobiles of their own, and they do not hesitate to use them as occasion demands. They reach the fire quickly, and thus accomplish results when other means of conveyance would be too late.

Fire Balloons.

A few complaints have reached the State Forester claiming that the so-called toy paper or hot-air balloons have been responsible for starting forest fires, and their use should be regulated. It can be readily seen that where the conditions are just right the damage from this source might be very serious. It is recommended, therefore, that in order to fly these balloons the participant be required to secure a permit from a forest warden, and that the liability for damages should they occur be the same as for other fires set out of doors.

Price to pay for fighting Forest Fires in Towns.

There seems to be no uniformity in towns regarding the price per hour paid for fighting forest fires. One town may pay 15 cents an hour and another 50 cents, while others range between these two extremes. At the various conferences of forest wardens held the past fall this question was brought up, and it was the consensus of opinion that a uniform rate should be adopted for the entire State. This question, however, is a local one; and, while 15 cents may not be enough, 50 cents seems high, and it is believed that the town forest warden should have the matter adjusted at the town meeting to meet his needs. One forest warden has an arrangement with his town chief of the fire department, whereby he can have experienced firemen at the rate of 50 cents for the first hour and 25 cents for each succeeding hour. A few live men who are willing and interested in the town's future welfare, with some up-to-date equipment, are worth much more than a large number of unorganized men, as frequently found at forest fires.

Slashings or Brush should be burned.

The common custom of allowing the slashings to remain upon the ground after lumbering operations leaves a veritable tinder box for forest fires. A fire once started here is soon beyond control, and the damage is not confined even to the area covered with slashings, but in most cases adjoining properties are endangered and frequently large areas are devastated. With forest products at present prices and the facts well understood that fires are the great menace to future forestry, it is time that we should enact laws regulating the handling of slashings.

The United States Forest Service requires that the brush resulting from lumbering operations upon the forest reserves be piled and burned as a part of any contract they let. Wisconsin has a special commission appointed by the Legislature to report recommendations toward regulating this matter.

There are few States that need to give attention to this subject more than Massachusetts. We are thickly populated, and the damages from fires are relatively great. Our markets are of the best, and as a matter of business we can ill afford to practice a slack policy.

If when operating our forest or wood lots the brush is made at the time into small piles, they can be burned at a time when there is no danger from spreading. It is advisable to burn the slashings when operating, if conditions are favorable, as they are then green; and, as the work is usually done during the winter season, there is snow on the ground, or sufficient moisture is present to prevent any spreading of the fire.

With the slashings and general debris out of the way, the fire danger is reduced to a minimum; and, whether the land is reforested by setting out seedlings or a copse growth established, the conditions for future success will be of the best.

Fire Lines and Protective Moth Belts.

It is a common practice in the gypsy moth work to surround badly infested colonies that otherwise would spread by making protective belts of 50 to 100 feet wide, and by thinning out the stand and opening up an avenue whereby the insects cannot pass

A fifty-foot fire lane to protect the plantation on the left In the center of the picture and at the inner edge of the fire lane is a six-foot trench, made with mattocks and shovels by taking off the turf which surrounds the planting. Burning brush in separate piles, when the snow is on the ground, to avoid forest fires. Work of the State Forester, carried on under the reforestation act.

without being destroyed. This protective moth belt is usually kept sprayed, and thus the insects are poisoned before they get across it.

This same belt can also be utilized as a forest fire line, as it serves to make a stand against a fire, if it is so desired. Old wood roads can be made to answer nicely for these belts. In the first place, the road is needed for getting spraying pumps through for moth suppression, and forest fire wagons need similar conditions; now, if roadsides are widened on either side, giving the width mentioned, both purposes are accomplished. Forest wardens and moth superintendents should take advantage of these conditions, and work together in getting more of these protective belts in the town.

Cape Forest Fires.

Each year great waste and destruction from forest fires seem to visit some section of the Cape country. This condition has continued so long and become so common that not only are many thousands of acres reduced to acorn brush deserts, but, from their being burned over every few years as soon as they accumulate enough vegetation to feed the flames, there is little likelihood of conditions improving until something is done.

Where fires have been kept out and even nature had a chance to assist, we find sufficient forest growth to really amount to considerable commercial value. Even on rough, rocky and ledgy lands, as well as those of pure sand, if we will keep out fires so that a forest floor can accumulate, the mulch or humus, which is composed of decaying leaves, twigs, etc., will form and here magnificent forests can be grown. The early history of this country tells us that the Cape was completely forested, and if it was once, it can be again reforested under modern methods. First of all we must stop the forest fires.

The pitch pine revels in the Cape conditions more than most other species, because it has a thick bark and can withstand fires better than most other trees; and then, again, it propagates easily from seed, even small specimens yielding more or less cones. If this tree will grow under such adverse conditions, were we to assist it in its struggle and even collect and plant or

sow the seed, start nurseries and transplant the seedlings, we soon could bring about great results on the Cape. Nor are we confined to the pitch pine. Many more species of trees will grow here when once they are given a little consideration as regards shelter, soils and freedom from fires.

Last summer a forest fire of approximately 10,000 acres burned over a territory in the towns of Bourne and Falmouth. Upon making a thorough examination of this fire, as to its causes, methods of handling, etc., it is evident that this forest fire which laid waste this vast territory could have been handled easily and controlled with comparatively no damage had there been any organized effort or suitable equipment.

From data secured through competent men, whose reports are now on file in the State Forester's office, together with photographs showing conditions where fires crossed roads, maps of the territory burned each day, it is evident that if we Massachusetts people are willing to allow such conditions to continue to exist, we certainly are neglecting our birthright.

If towns are not willing or able to protect themselves, the State should step in and regulate or assist. Since this large fire the towns adjacent have been aroused to activity in future protection, and it is hoped this interest may not die out until something results.

It is generally acknowledged that these fires originate from Mayflower gatherers and blueberry pickers. It is evident that this being the case, some regulations must be made for fixing the responsibility and punishing the offenders.

It is understood that the association composed of the boards of selectmen of various towns expects to ask some legislation on this subject this year.

Authority to accept Donations.

If the State Forester were given authority to accept lands or funds on behalf of the Commonwealth which are to be used for State reserves and managed by the State Forester, with the understanding that all net sales from the management of such lands shall be used by him for improving State forestry conditions, subject to the approval of the Governor and Council, it is

believed the State would derive a great deal of benefit. This suggestion has come to the office a few times from such sources as we have reason to believe would be interested in aiding the future forestry work in Massachusetts.

Public Lectures and Addresses.

As heretofore, the State Forester has endeavored to do as much of this kind of work as he could consistently, and keep up the regular routine work of the department. More engagements have been filled than ever before. The policy of accepting invitations preferably when a large and representative audience is assured (not less than 100), and the meeting an open one, has been adhered to this year, as last. The requests for lectures have been greater than ever.

Besides the 51 lectures by the State Forester, occasional engagements have been filled by assistants. The usual course of lectures was given at the Massachusetts Agricultural College during January.

Meeting with the State Firemen's Association.

The State Forester was requested to again address the State Firemen's Association on the occasion of their annual meeting, held at Plymouth, September 15. Chiefs of the fire departments have expressed a willingness to co-operate with forest wardens in suppressing forest fires, and have offered in many instances to instruct the wardens in the use and care of extinguishers. The State Firemen's Association also sent representatives to address the conference meetings of forest wardens at Northampton and Boston, the subject being, in each instance, "The Co-operative Relations between the Firemen's Association and the Forest Wardens."

The Society for the Promotion of Agricultural Science.

This organization, which is the oldest and most influential society of the kind in this country, held its meeting at Portland, Ore., on August 17, and the State Forester, who is secretary-treasurer, attended this meeting. The special program for this occasion was "Forestry," and various phases of the subject were

discussed by leading scientists from different sections of the United States. This meeting was held directly after the National Irrigation and Forestry Congress, and just before the Association of American Agricultural Colleges and Experiment Stations.

I also visited Seattle, where the Alaska-Yukon Exposition was held. Besides the excellent forestry exhibit, occasion was offered here to spend some time with the fire warden of the State of Washington and various lumber companies, in getting a better idea of the forestry methods used.

The following statement was given to the press upon my return: —

On a recent trip through the northwest, I have had splendid opportunities to examine the magnificent forests of that section. This was not my first trip, and hence, from a forester's standpoint, it has proven even more interesting. One is first impressed with the great amount of forest products and particularly by the cheapness thereof; but upon further reflection and study of the area and prices, it grows upon one that after all we Massachusetts people get very little benefit from them. While prices are relatively low, that country is so far away that other than for our best grades it is prohibitive for our use. Fine, square-edged lumber is looking for a market in Washington to-day, and it is offered for much less per 1,000 feet than we get for our round-edged box boards. There are hundreds of miles of treeless areas between here and there, and a country that will demand in a few decades even more forest products than the famous forests will be able to supply. We Massachusetts people must depend for our future lumber supply, I am convinced, upon our own well-directed efforts.

Our people may think their State Forester is overzealous in regard to forestry matters, but he is more willing than ever to go on record in stating that there are few subjects of more importance at the present hour that really need the attention of our Massachusetts people than that of reforestation, and even more mandatory laws governing forestry management. Every dollar rightly spent in the old Bay State now is bound to return us 100 per cent. in future benefits.

Conferences of Forest Wardens.

During the latter part of October and fore part of November the State Forester held a series of five forest warden conferences, which were distributed evenly throughout the State. All the forest wardens of the State were invited to attend, with their

travelling expenses paid, as per chapter 475, section 8, Acts of 1907. The first conference was held at Pittsfield, on October 14, and included all of the towns in Berkshire County; the second, at Northampton, on October 29, included Hampshire, Hampden and Franklin counties; the third, held at Boston, State House, on November 4, included all the towns in Essex and Suffolk counties; the fourth convened at Worcester, on November 11, and included the towns of Worcester County; while the fifth, held at Middleborough, on November 18, consisted of all the counties of the Cape, Plymouth, Barnstable and Dukes.

These meetings were the first attempts to get the forest wardens together. The conferences were in each case held throughout one day, beginning at 10 o'clock and continuing until 4 P.M., taking out only forty-five minutes for lunch. The program consisted in a general outlining of the State's policy by the State Forester, which was followed by a discussion for the remainder of the forenoon, in which the wardens took an active interest. Other subjects discussed by competent speakers were: reforestation; forestry management; forest insects and their control; co-operation of railroads; co-operation of chiefs of fire departments with forest wardens; forest fire equipment; co-operation between towns, etc.

As was expected, there was not sufficient time to go into the subjects in detail, but one of the great benefits was in getting the wardens together, and setting them to thinking in lines of accomplishing results in their towns.

Splendid interest and a very co-operative feeling were manifest at each meeting, and it is the opinion of your State Forester that the expenses for these meetings will be as productive of future results as any money investment this year. The total expenses of the five meetings did not exceed $500. The benefits of these conferences are already shown in the increased interest of the forest wardens in sending in reports of fires and in asking for assistance in their work. This conference in the future will resolve itself into a gathering whereby we may keep posted on modern methods of fire fighting and other forestry operations.

Municipal Forests.

This type of forestry work has again received more or less of our attention this year. The forest working plan for land belonging to the city of Fall River in the North Watuppa watershed, which is the water supply for that city, was completed and published in a bulletin from this office. This bulletin has not only proved of interest to other cities and towns as well throughout the State, but has been called for by many cities from outside the State. When the advantages to be derived from such undertakings become more fully understood, there is little doubt but that the recommendations outlined in the bulletin mentioned will be generally carried out and put into practice. This bulletin was not generally distributed, but can be had by any one interested in such work.

Bulletin on Forest Fires.

A bulletin entitled "We must stop Forest Fires in Massachusetts," was published during the year. It contained 44 pages, and was published that our people may realize more fully the exact condition of forest fires in the State, and especially to bring together data for the benefit of our forest wardens and their deputies, that they may know what the better towns of the State are doing, thereby gaining new ideas and being enabled more intelligently to accomplish good results in their own communities. The bulletin contains several illustrations of forest fire wagons and equipment, together with estimate costs; and gives a list of all the forest wardens, with their addresses, from each town and city in the State.

Bulletin on Thinning.

The first bulletin on "Forest Thinning" has been exhausted for some time, and we have a new bulletin now in press on this subject, which contains some definite experimental data of Massachusetts conditions and treats the subject in an up-to-date manner. This bulletin will be of interest, we believe, to the whole State, and particularly throughout the gypsy-moth-infested

One of the roads that the Bourne fire crossed. Had this roadway been widened, it would be a natural fire lane. Had there been a well-organized force, the fire should have been stopped here. By making a study of our town and wood roads throughout wooded sections, and widening them for fire belts, much of our present fire losses could be curtailed.

territory; for, by thinning our woodlands properly, the conditions are not only better for forestry proper, but for the suppression of insect pests.

Permit Act, Result of Vote.

The results of the vote by our Massachusetts towns on the permit act were very satisfactory, and for the most part the act was adopted. The failure of a few towns to accept the provisions was found to be due to a misunderstanding of the objects sought, and they will probably adopt the law at their coming annual town meetings. Forest wardens generally are convinced of the value of the permit act in lessening forest fires, while this office can point to far more efficient service throughout the State.

Massachusetts Fire Permit Law. — Towns accepting Chapter 209, Section 5.

Towns voting to accept the law,	248
Towns voting to reject the law,	15
Towns failing to report on vote (probably favorable),	47
Towns postponing action on the law,	7
Chapter 209, section 5, does not include the cities whose ordinances should cover same,	27

Co-operation with the United States Forest Service.

The State Forester has been favored with hearty co-operation from the United States Forest Service throughout the year. The work on "Massachusetts Wood-using Industries," which was begun last year, has been completed and is now in press. Mr. H. S. Hackett, in charge of wood utilization, and Mr. Hu Maxwell, expert, both of the United States Forest Service, have rendered us splendid service in this work.

Recently arrangements have been made with another department of the United States Forest Service, under the supervision of Mr. J. G. Peters, to carry on some co-operative work in forest survey work.

The State Forester wishes to acknowledge many other courtesies extended to him by Mr. Gifford Pinchot and the United States Forest Service.

Pine Tree Blight.

The alarm in regard to the disease called the pine tree blight, which was so prevalent two years ago, has very much subsided of late. Occasional trees have died from this cause during the year, but nothing equal to the number of last year, which in turn was less than that of the year before. Our people generally have become familiar with it, and are following the practice of cutting out and utilizing all pine trees of commercial size that are badly affected. It is quite generally believed that we have little to fear from this malady in the future in growing white pine.

The Chestnut Bark Disease.

This disease of the chestnut has been extremely disastrous along the southern Hudson River district and in certain sections of Connecticut. By reading about it and its results in the above-named territory, many of the people owning chestnut forests have become alarmed and written to our office. We have not as yet had any large area reported which was thought to be infested with this chestnut disease. Experts on the subject seem to differ as to the cause of the depredation. The United States Department of Agriculture claims the disease is *Diaporthe parasitica,* and that it is contagious; while equally skilled botanists, like Dr. G. P. Clinton of Connecticut and Dr. G. E. Stone of Amherst, claim that it is due to unfavorable climatic conditions.

It is believed to be unnecessary for us to worry at present over the chestnut bark disease in Massachusetts. If chestnut trees here and there become unhealthy, it is a safe rule to remove them, and thus minimize possible trouble. This method we are practising with the white pine blight. It is certainly to be hoped that this trouble may not come our way, for our chestnut growths are valuable properties.

Forestry Exhibits.

During the year various forestry exhibits, mainly showing moth work and seedlings, have been made, the principal ones being before the following organizations: the New England

apple show, Boston, October 18–23; the Boston "1915 Exhibition," Boston, during November and part of December; and at the meeting of the American Association of Economic Entomologists, Boston, December 27-29. The other displays were largely made before agricultural fair associations in the newly infested sections.

Massachusetts Forestry Work recognized in Other States.

During the past year we have had cause to feel complimented upon our work, as the State of New York, in a bulletin entitled "Instructions for Reforesting Lands," published, with due credit, many tables found in our handbook on "Forest Mensuration of the White Pine." Also, this pamphlet of ours has been sought by many forest schools. Another of our publications, "Forest Trees of Massachusetts, how you may know them," a pocket manual, was practically copied in full by the Maine Forestry Commission. Other States have in part adopted the Massachusetts forestry legislation.

Expenditures and Receipts.

In accordance with section 6 of chapter 409 of the Acts of 1904, as amended by the Acts of 1907, chapter 473, section 2, the following statement is given of the forestry expenditures for the year ending Nov. 30, 1909:—

Forestry Expenditures.

Salaries of assistants,	$3,875 70
Travelling expenses,	1,083 24
Stationery, postage and other office supplies,	1,048 35
Printing,	1,018 85
Instruments,	80 17
Forest warden account,	290 44
Nursery,	2,305 94
Co-operative work with the United States Department of Agriculture,	215 00
Miscellaneous,	81 95
	$9,999 64
Balance,	36
Total appropriation,	$10,000 00

Reforestation Account.

Seedlings,	$771 01
Land,	1,792 50
Labor,	5,769 47
Equipment,	663 58
Travelling,	846 31
	$9,842 87
Balance,	157 13
Total appropriation,	$10,000 00

There was realized from the sale of publications $73.62, which amount has been turned over to the Treasurer and Receiver-General. If to this amount are added the amounts unexpended, $157.49, we have $231.11 as a credit for the year.

In accordance with section 5 of the above-named chapter, the following statement is given of the receipts for travelling and subsistence: —

Lectures.

Auburndale Improvement Association,	$0 50
Attleborough Women's Club,	1 50
West Manchester Women's Club,	–
Montague Agricultural School,	50
Cornell Club,	2 00
Leominster Board of Trade,	1 74
Quincy Unitarian Club,	46
Amesbury Women's Club,	1 70
Cambridge Entomological Club,	–
Mangus Club, Wellesley Hills,	50
Fall River Natural Science Association,	5 00
Chicopee Falls Women's Club,	5 50
Milton Women's Club,	35
Agriculture Board of Trade,	2 50
Farmers' Institute, East Charlemont,	6 24
New England Rural Conference,	–
Concord Women's Club,	85
Men's Club, Melrose,	1 00
Fitchburg Grange,	3 00
Farmers' Institute, Brimfield,	4 55
Boston Merchants' Club,	2 00
High School Masters' Club,	75

North Reading Grange,	$1 29
Farmers' Institute, West Brookfield,	4 15
Plymouth Board of Trade,	3 50
Middlesex Women's Club, Lowell,	2 50
Lexington Grange,	1 25
Lee Grange,	8 10
Swift River Valley Pomona Grange, Greenfield,	6 67
State Board of Agriculture, Cummington,	10 14
New Hampshire Board of Trade, Manchester,	4 00
State Firemen's Association, Plymouth,	3 50
Board of Agriculture, Barre, Fair,	3 10
Pittsfield Wardens' Conference,	–
Northampton Wardens' Conference,	–
Boston Wardens' Conference,	–
Worcester Wardens' Conference,	–
Middleborough Wardens' Conference,	–
Gardner Women's Club,	3 31
Channing Club of Boston,	1 00
Hyde Park Current Events Club,	50
The Atalanta Club, Lynn,	1 10
Palmer Men's Club,	3 40
Cantabrigia Club, Cambridge,	1 00
Boston Society of Civil Engineers,	1 22
Economic Club, Boston,	22
Boston Market Gardeners' Association,	2 00
Massachusetts Reform Club, Boston,	22
Massachusetts Forestry Association,	–
Conservation Club, Kingston,	1 50
American Forestry Association,	25 00
Friday Club, Everett,	25
Webster Grange, Marshfield,	1 50
Becket Camp, Becket,	4 00
Harmony Grange, Easton,	1 00
Holden Farmers' Club,	1 00
Cape Ann Literary Association, Gloucester,	1 25
American Association of Economic Entomologists,	–

A list of the visits made, the area of woodland involved and the receipts for expenses, are as follows: —

Examinations of Woodlands.

Name of Owner.	Town.	Area (Acres).	Expense.
Adams, Sarah E.,	Pembroke,	7	$2 00
Barryune, F. J.,	Lynnfield,	22	1 00
Barnes, H. K.,	Shirley,	43	1 40
Burbank Hospital,	Fitchburg,	400	12 40
Burgess, J. K.,	Dedham,	50	50
Carpenter, S. I.,	Sharon,	15	80
Clapp, W. A.,	Ashland,	90	1 00
Cook, Robert,	Brockton,	50	1 00
Cunningham, Paul,	Bolton,	125	1 45
Crane, A. S.,	Weston,	5	—[1]
Dole, W A.,	Townsend,	28	1 60
Emery, Miss M. E.,	Newburyport,	55	1 50
Foxborough State Hospital,	Foxborough,	110	1 25
Fillebrown, Mrs. W.,	Plympton,	50	1 25
Gaskill, D. W.,	Blackstone,	75	1 50
Gilbert, E. H.,	Ware,	170	3 50
Greenwood, Levi,	Gardner,	275	4 80
State Board of Insanity,	Lexington,	20	2 80
Hubbard, Eliot,	Millis,	40	90
Humphrey, L. C.,	Rochester,	200	2 10
Hyde, H. S.,	West Springfield,	60	4 30
Jones, C. H.,	Weston,	200	—[1]
Joslin, E. P.,	Oxford,	100	2 40
Harlow Brook Cranberry Company,	Wareham,	1,000	2 00
Libby, F. M.,	Wakefield,	10	—[1]
Manning, Warren,	Billerica,	78	—[1]
Milford Water Company,	Milford,	175	1 50
McCarthy, N. F.,	Lynnfield,	50	—[2]
Matthews, W. L.,	Conway,	50	4 60
Morse, Prof. A. D.,	Pelham,	300	3 80
Needham Park Board,	Needham,	60	35
Newton City Forester,	Newton,	10	—[2]
Paine, Chas.,	Sturbridge,	125	3 00
Parker, F. H.,	Westborough,	175	1 00
Parker, Chas. S.,	Westford,	23	70
Prescott, C. W.,	Concord,	60	—[1]
Simmons, H. F.,	Hanover,	10	1 25

[1] Train fares paid by owner. [2] No expense.

Examinations of Woodlands — Con.

Name of Owner.	Town.	Area (Acres).	Expense.
Swett, Frank,	Westminster,	103	$2 50
Symington, R. B.,	Plymouth,	2	3 95
Thorndike, R. K.,	Millis,	20	90
Tolland Fish and Game Association,	– –	500	8 50
Walker, Mrs. J. G.,	Hamilton,	6	1 00
Warren, Fiske,	Harvard,	285	1 85
Whitney, Fred,	Leominster,	12	1 75
Williams, G. F.,	Needham,	200	–[1]
– – –	Canton,	8	–[2]
Y. M. C. A. Camp,	Becket,	200	5 40
Massachusetts Fish and Game Association,	Carver and Plymouth,	6,000	3 40
Barclay, Fred,	Spencer,	200	–[2]
Freeman, Lucy,	Wrentham,	30	1 30
Hillside Industrial School,	Greenwich,	300	4 00
Gloucester Common,	Gloucester,	1,500	2 05
Conservation Association,	Kingston,	1.000	1 50
Bill, Nathan D.,	Worthington,	600	4 80
Adams, Chas. F.,	Lincoln,	500	70
Newton, Mr.,	Royalston,	23	3 00
Dexter, Prof. F. B.,	Fairhaven,	8	2 70
Symington, R. B.,	Plymouth,	4	2 00
Thompson, M. S.,	Newbury,	40	1 50
Lane, Emory,	Waltham,	5	–[2]
Total,		10,860	–

[1] Train fares paid by owner. [2] No expense.

Part II.

GYPSY AND BROWN-TAIL MOTH SUPPRESSION.

Part II.

GYPSY AND BROWN-TAIL MOTH SUPPRESSION.

General Considerations of the Year.

The work of suppressing the gypsy and brown-tail moths in the year 1909 has been carried on along well-defined lines which have been determined through previous experience to be the best, and in most cases gratifying results are shown. Weather conditions have been favorable for our work, and also for insect life. Natural causes, such as the wilt disease of the gypsy moth caterpillars, have been helpful to some extent in badly infested woodlands. The brown-tail moth caterpillars came through the winter season very well, and but a small amount of the fungous disease was noticeable; consequently, there was need of more work against this insect than in previous years. The usual methods of treating the gypsy moth egg clusters with creosote, and removing the brown-tail webs and burning them, were prosecuted vigorously during the winter and early spring, and unusually extensive spraying operations were carried on during the caterpillar season; there were 150 large power outfits in operation, and 200 hand outfits; consequently, more noticeable results were obtained from spraying than in previous years. There were used, as near as can be ascertained, about 300 tons of arsenate of lead. The maximum number of men engaged in the work at any one time during the year was 2,750.

During the month of August in many cities and towns there was a cessation of field work, on account of lack of funds, owing to the fact that so much more spraying than usual was done in June.

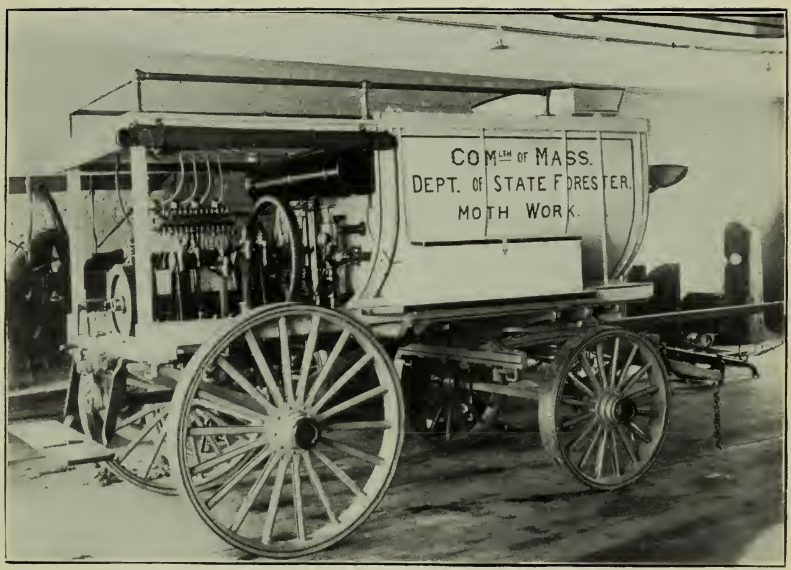
The area infested by the gypsy moth in Massachusetts comprises 3,950 square miles. Although the known spread has been

very slight during this year, the infestation in the central western part of the State is being watched closely, as it is from that point that the insect is most likely to spread, and thus far no noticeable increase has been made westward. It is generally believed from observations that the spread of this year has been northerly, if in any direction.

The work carried on by the cities and towns has been commendable in most cases, although there are a few instances where the indifference of the people, or the neglect and lack of interest on the part of the public officials, has caused great annoyance and considerable damage. Unfortunately, these cases have been in some of our large cities, and have given the bordering places anxiety. There are municipalities where the infestation has been bad in previous years, and where the property holders have suffered greatly from the pests, and much money has been expended, with the result that they are now in comparatively good condition. Here, efforts are apt to be relaxed. If these places are not carefully watched now, there will be a repetition of the conditions of past years.

In October a reduction of our field force was made, for, as the local superintendents have had nearly five years' experience in the work, less inspection and instruction from this office should be necessary. This will make a saving in supervision, and enable us to assist cities and towns financially to a greater extent. The infested area has been divided into 15 divisions, and a division superintendent retained for each division. The inspectors we have retained are also responsible directly to this office. Most of our agents and division superintendents have been provided with motor cycles, and are now able to keep in closer touch with the work in their towns for about nine months in the year than before, when they were dependent upon steam or electric cars, or walking.

By the approval of the Governor, the co-operative work in the north shore woodlands has been carried on as in previous years, with an expenditure there of nearly $58,000, of which $22,500 has been furnished by the State. A much larger area was covered than in 1908. This office has also supervised the scouting work on the State highways for the State Highway Commission.



Gasoline power sprayer, built by State Forester's department, with four-cylinder engine and triplex pump, the latter designed by same department, capable of furnishing 300 pounds' pressure in woodland work. Weight of outfit, 3,000 pounds.

Apportionment of Allotments.

The problem of apportioning our appropriations among cities and towns where the liability under the law is not sufficient to cover the necessary work, is one of the most difficult connected with this work. At the beginning of the fiscal year it is comparatively easy to apportion the continuing appropriation according to the needs of each town; but later in the year, when the Legislature has made an additional appropriation, as it has in years past, which must be divided fairly among the most needy municipalities, a problem arises which is hard to solve. This is because we are often unable to secure proper returns of expenditures already made from cities and towns expecting reimbursement. These cities and towns are not unaware of the necessity, but they are neglectful.

When allotments are made, local officials should all see to it that expenditures are kept within the limits laid down by this office, unless they are willing, if need be, to provide for the extra expense by extra town appropriations. It should be the aim of each local superintendent to carry on his work as economically as possible, and in cases where large allotments have been made in the past, the towns should be nearer to being self-supporting each year. There are still, however, badly infested towns needing more money than the State can give them at the present time, with available funds.

Scouting.

At the beginning of the year 1909 it did not seem advisable to do scouting work to the same extent as in the past two years, as the towns bordering on the infested area had been carefully inspected last year. Only such places, therefore, as were most exposed to infestation were scouted. In previous years the whole cost of this work has been borne by the State, but this year arrangements were made for cities and towns to employ our trained men to do the work, and much better results were thus obtained. We believe it to be good policy to do this scouting when necessary, as small infestations can be handled easily when first found, and often stamped out if taken in hand in time.

In the central part of the State 15 men were employed in this work, and gypsy moth infestations were found in the following places: Hopedale, Lancaster, Mendon and Northborough. Also, the following towns were scouted, but nothing found: Blackstone, Boylston, Sterling, Uxbridge and West Boylston.

In the southern part of the State 6 men were employed, and the following towns and cities were thoroughly scouted: New Bedford, Fairhaven, Marion and Mattapoisett. In several other infested towns in this section our trained men were employed to scout thoroughly, that the exact conditions might be ascertained.

In the extreme western part of the State, the towns of Lee, Lenox and Stockbridge were given a thorough examination, as they are much frequented by automobiles from the heavily infested section. The main highways in the city of Pittsfield were also scouted, but nothing was found in any of this western section. In the city of Springfield and the towns of Greenfield, Palmer and Warren, where infestations were found in 1908, no signs of the moths have been seen this year. During the coming year it may be advisable to do some scouting in the towns of Orange, New Salem, Dana, Hardwick, New Braintree, North Brookfield, Brookfield, Charlton and Sturbridge, but this will depend largely on conditions found in adjoining towns.

The Condition of the Infested District.

The larger part of the area known to be infested with the gypsy moth is to-day in most cases in a better condition than at the time of the writing of the last report. The work in the sections where the worst infestations have been found this year has been done generally in a very thorough manner, and excellent results obtained. This applies mostly to residential sections, and belts in woodlands for the protection of sections already cleaned. In our judgment, these good results are due to the efficiency of the local forces, gained through their long training in certain towns where the moth work has been carried on extensively. We have done, as far as possible, the necessary work in the worst-infested districts, but the woodland work still suffers from lack of funds.

In some places results worthy of note have been obtained, as

in the case of the city of Newton. Here, through the neglect of the city government to make suitable appropriations at the time when the infestation was light, and when it could have been handled with comparatively little expense to the city, a large expenditure of money has been necessary this year to keep the moths in check. In the latter part of the year 1908 this city realized the danger which threatened it from the ravages of the gypsy moth, and took hold of the situation in a competent manner, engaging an experienced man to take charge of the work. Throughout the year 1909 the work has been carried on vigorously. At times it has been necessary to employ as many as 200 men, and during the caterpillar season a large number of spraying machines were used. This surely should be an example and object lesson for such places as are to-day in similar condition to that of Newton, and funds should be made available at the proper time, as suggested by this office. It is a fact that where, through the indifference of the local government, moth pests are allowed to go unchecked for a certain length of time, the result is a large expenditure finally, and severe damage from the ravages of the moths. In sections where infestations have occurred in the northern part of the State, not as bad as in Boston and vicinity, the gypsy moth has shown some increase from the fact that in most cases the cities and towns were not able to engage experienced men for the work in the past; that is, this year's scouting has been done by more experienced men, and therefore has perhaps in some places brought to light more widespread infestation, but in most cases this infestation is very light, and should cause little anxiety. Where the infestation is light, the towns as a rule have handled it well, and these places have also been given close supervision by our men.

It is the aim and object of this office, where it is possible, to put cities and towns infested with either of the pests in a condition so that they may become self-supporting; that is, in such condition that the towns' own liability under the law ($\frac{1}{25}$ of 1 per cent. of the valuation of the town or city where it is under $12,500,000, or $5,000 where the valuation is over $12,500,000) will pay for all the necessary work to keep the towns free from the nuisance. We expect the coming season with the expendi-

ture of small sums from the State to have several municipalities put in this condition by doing thorough suppressive work.

We shall also be obliged, in several cases where cities and towns are not ready to make necessary appropriations, to adopt such methods as the law allows to make sure that the necessary work is done in a thorough manner. Although these cases may be few, it is not justice to the adjoining cities and towns to allow such places to continue delinquent in making appropriations, or to continue to do the work in an unsatisfactory manner.

Work in woodlands which are heavily infested should be given careful consideration before it is entered upon. If it is found necessary to take such work up, careful consideration should be given to the future, as it will probably mean a continued expense for some years to come, and it is not good policy to take up this work where it can not be followed out and carried to completion. The land valuation of woodlands is usually very low, and where only ½ of 1 per cent. can be collected from owners, the expense of cleaning falls almost entirely upon the city or town, and State; and we believe that there should be some way provided by law, in cases where property owners will receive benefit from these operations, to make larger assessments on the same. The cord wood which is removed from cleaned woodland would in most cases pay for the greater part of the thinning; and, as expert foresters are available at all times in this office to lay out woodland work along scientific lines, the property owner is bound to profit in the end from this treatment.

The woodland work done the past year, with the exception of that done on the north shore, has been confined in most cases to the most valuable wood lots, as it seems a waste of money to expend large sums on scrub land.

The question of woodland work in any town should be taken up with representatives of this office, and a very thorough understanding of the matter reached before entering upon work of this kind. The condition of the residential section of the town must be considered before taking up woodland work. A prime consideration in woodland work is that it shall be of a protective nature, either to protect estates, or adjoining property which is not infested. In cases where a light infestation occurs, and the

necessary funds are available, it is advisable for some time to come to do nest treating through as much woodland as possible. This will hold the general infestation in check until such aid as may come from natural sources is sufficient to be appreciated.

The conditions in the woodlands on the south shore promise to be serious in the future, unless handled by removing the deciduous trees and confining the growth almost entirely to conifers. Through some part of this section there are valuable areas of white pine, and the work of clearing is being prosecuted vigorously, in the hope that we may save most of it, or that but slight damage may occur.

In the section of our State which borders on the New Hampshire line the work is being done very carefully, and very little spread is likely to occur from any of these bordering towns. However, the work is not as well done across the line in New Hampshire, where inadequate appropriations are made for the work, and very little care taken regarding the spread of the insects. It is our feeling that we should be given more protection here, as the expenditure in this section amounts to a large sum.

In the past season the brown-tail infestation in the Merrimac valley bordering along the New Hampshire line was very serious, caused chiefly by the fact that no suppressive work was done across the line. In fact, the infestation was so heavy that large sums of money had to be expended in work against these moths, thus handicapping our appropriations which otherwise could have been used in gypsy moth work, where it was much needed. The reinfestation of towns or estates already cleared, by proximity to neglected towns or estates, is one of the serious problems with which we have to contend.

It may be interesting to note in this connection that from reports made to this office we find the number of acres sprayed throughout the infested district during the season to be 7,776; the number of burlaps put on, 698,597; and the number of tanglefoot bands, 26,313. These figures are of course approximate, several towns not having made complete returns.

Conference of Moth Superintendents.

On December 10 a meeting of all the local moth superintendents of the oldest infested districts was held at room 240, State House. The conference lasted from 10 A. M. to 4.30 P. M. In so far as possible, all the important points about future policies of the work were discussed by the State Forester and his assistants. Representatives from the laboratory discussed the parasites and their work, also specimens were passed about, to familiarize the men with them. The moth superintendents were left free to ask questions, and it is believed the day's efforts were well spent and will result in more efficient work this winter.

Spraying Operations.

During the year 1909 the spraying operations carried on against the gypsy moth caterpillars have been on a larger scale than ever before, and extremely good results have been obtained in most cases. The use of arsenate of lead in spraying the foliage has become one of the most efficient methods used in suppressing injurious insects, it being beneficial to the crop and detrimental to the insect. In cities and towns where the work has been carried on in an intelligent manner for the last four years, the street trees should be in such condition that spraying should not be needed; but during the past season the ravages of the elm-leaf beetle have been so severe in many such places as above mentioned that considerable spraying has been done on street trees for elm-leaf beetle where very little benefit was derived on the moth work. In a good many cases the spraying should have been done in other sections, to benefit the gypsy moth work; consequently, our work has suffered to some extent from this cause. The introduction of power outfits and their continued improvement has been one of the greatest benefits to the suppressive work against insects which we have ever had, for the problem is of such great magnitude that it would be impossible to accomplish the same results without them. It is believed that even more improvements will be made in the future as this method of combating insect pests is in its infancy at the present time.

OLD METHOD. NEW METHOD.

The above illustrations show nozzle and shut-off designed by State Forester's department for woodland work, with ¼ inch straight tip; also, the nozzle formerly used, 18 inches long. Note difference in spray, as the long nozzle is carrying stream higher before breaking into mist.

The work of climbing large trees must be done away with as much as possible, as, in the limited amount of time in which spraying is effective, it is necessary to cover as much area as possible, and climbing is slow and expensive work. In using high-power outfits, the greatest care must be given to the way in which the solution reaches the foliage, because if it is put on with too much force the larger part of it runs off the leaves, and good results are not obtained; it is very essential that it be put on as nearly in the form of a mist as possible. The greatest trouble in many cases is that the man holding the nozzle stands too near the trees he is trying to spray; if care is used, the greater part of the foliage can be sprayed with the straight stream, and good results obtained.

Careful attention should be given to the machine itself, as breakdowns are often caused from neglect or inattention. As soon as a small fault is noticed it should be repaired, as if neglected it many times causes bad breaks and long delays. Machines should be kept properly oiled and cooled, the spark plugs clean, and plenty of gasolene on hand. Valves should be looked at if there is an uneven pressure. The machine should be given a thorough overhauling before starting for the field of operations. Good care should be taken of the machine, so that the depreciation from use may be as small as possible. The weight of large outfits often causes much comment, yet it must be considered that in order to obtain the necessary power and capacity a machine must be fairly heavy. Any machine that is in the market to-day can be easily handled on hard roads with two horses, but in doing woodland work it is necessary in nearly all cases to use four horses. The extra cost is not to be compared with results obtained. Much moving of apparatus can be avoided by using long lines of hose.

Poison should be used as economically as possible. The large amount used to-day makes the work very costly, and 10 pounds to 100 gallons of water in the first four stages of the caterpillar will give just as good an effect as a larger amount.

Observations should be made within three days of the spraying, to determine whether the work has been skilfully and effectively done. If caterpillars are still eating, and no dead ones

can be seen, the work has not been successful. Some of the causes which might account for this kind of work are as follows: weak poison, wet foliage, inefficient man at the nozzle, failure to cover the tree well, poor agitation, and presence of soluble arsenic in the arsenate of lead. This office furnishes the following formula for arsenate of lead paste: —

50 per cent. dry arsenate of lead.
No less than 15 per cent. arsenic oxide (AS^2O^5).
To contain not more than ¾ of 1 per cent. of soluble arsenic.
To contain no free acids or adulterant or inert substances.
To be in a good mechanical and physical condition.

Dealers should be required to supply arsenate of lead which will stand test for this formula.

Co-operation on State Highways.

At the request of the State Highway Commission, which has a separate appropriation for the work of suppression of gypsy and brown-tail moths on State highway trees, this office has taken charge of the details of the work for the commission as in previous years, and also has supervised the elm-leaf beetle work on State highways in our infested districts. It has not been necessary during this year's campaign to do as much thinning on the State highways as in previous years. We have also been very fortunate in getting the federal authorities to take up some work on State highways, which has helped us considerably and has been of no expense to the Commonwealth. The elm-leaf beetle problem has been a most serious one the past year, and possibly has not been given as much attention as it should have had, as the infestation in some cases was new and unexpected. In the coming year more money must be available, and the elm-leaf beetle problem must be taken up at an early date, as part of the infestation occurs in towns and cities where we are doing very little spraying for the gypsy moth. The work of destroying the gypsy moth egg clusters and removing the brown-tail webs has been nearly completed at the present time, although there are a few remaining miles of road to be done in the near future.

This office recommends, also, the removal, if possible, by the State Highway Commission of some of the trees on the highway where they are in large numbers, more than are needed for good shade.

Work was done at a total cost of $5,079.56 on the State highways in the following towns and cities: —

Abington.	Harwich.	Scituate.
Acton.	Haverhill.	Shrewsbury.
Amesbury.	Hudson.	Southborough.
Ashland.	Kingston.	Stoneham.
Barnstable.	Lancaster.	Stoughton.
Bedford.	Leominster.	Sudbury.
Bellingham.	Lunenburg.	Swampscott.
Bourne.	Marlborough.	Taunton.
Boxborough.	Marshfield.	Tewksbury.
Bridgewater.	Melrose.	Townsend.
Brewster.	Merrimac.	Truro.
Brockton.	Methuen.	Tyngsborough.
Chatham.	Middleborough.	Walpole.
Chelmsford.	Natick.	Watertown.
Cohasset.	Needham.	Wellesley.
Concord.	Newbury.	Wellfleet.
Dracut.	Newburyport.	Wenham.
Duxbury.	Norfolk.	West Bridgewater.
Falmouth.	Northborough.	Westborough.
Foxborough.	Orleans.	Westford.
Framingham.	Pembroke.	Weston.
Franklin.	Plainville.	Westwood.
Gloucester.	Quincy.	Weymouth.
Groton.	Raynham.	Winchester.
Hamilton.	Reading.	Wrentham.
Hanover.	Rockland.	Yarmouth.
Harvard.	Salisbury.	

National Aid.

In our work against the gypsy and brown-tail moths in this State during the year 1909 we have received considerable assistance from the federal government, in the way of clearing up strips along roadsides where distribution was liable to occur. This work is extremely helpful to this office. However, we feel that, though the quality of the work is good, there should be

more of it done by the federal authorities; that is, larger appropriations should be available. About $750,000 are expended by the State, cities and towns and private individuals in this work during one year, while the federal government appropriates only $300,000, and this must go to assist other New England States as well as Massachusetts. Our woodland infestations, in a great many cases where it has not been possible for us to do any work in the same, are gradually coming to the roadsides, and the road problem in our infested district now needs serious attention. We have made several suggestions to the federal authorities, such as that by making the strip which they clean along the roadsides narrower they might increase the number of miles which could be covered; but, as they have their plans made, and feel that what work they do must be absolutely protective, they do not think it wise to make the strip any narrower. It would be extremely helpful to our work and to the Commonwealth if larger federal appropriations could be secured and more work done in Massachusetts. However, we are thankful for what we are receiving along this line, and hope that it will continue and increase in the future.

Supplies.

We made a careful estimate of the expenses of supplies for the State work during the past season, and it was found that had this office purchased them in large quantities, and supplied the towns the State is reimbursing, there would have been a saving of at least $20,000. The results of this investigation were sufficient to secure the approval of the Governor in establishing a supply store by this office, from which supplies are to be hereafter sent to cities and towns receiving reimbursements from the State.

The local superintendent in charge of the work has been obliged to buy in quantities as needed for the local organization, and that necessarily in most cases is in small lots. Much lower prices can be obtained by purchasing in large lots. Also, it was found that in ordering supplies from Boston it was necessary for the local men to make several trips to the city in order to select the goods wanted. This office has also ex-

perienced considerable trouble in obtaining schedules of bills with receipted vouchers for supplies, and the examination of these papers has entailed a large amount of bookkeeping. Under our new system a part of this can be done away with. It will not be necessary for the local man to come to Boston personally to order his supplies, as he is furnished with a complete list of the supplies the State furnishes. These have been very carefully selected by experienced men, and the town officials are assured that it is our intention to furnish tools and supplies which will be best suited to the work. It is always desirable to have the local superintendent spend as much time as possible with his men, as efficient supervision means efficient work, and this arrangement will save much time.

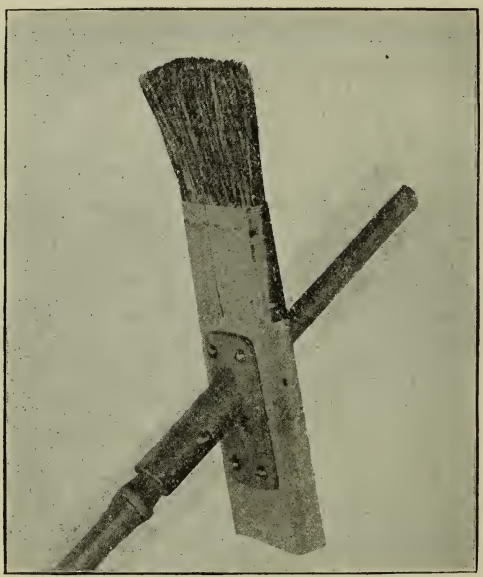
We have asked the local official who has charge of the work in the towns and cities where we are furnishing supplies for any suggestion which he thinks will improve this new system, and if at any time local superintendents can buy as cheaply and get as good quality of goods, we shall be willing to authorize them to do so.

Experimental Work.

In the four years past very little experimental work has been carried on by this office, and we have been at the mercy of manufacturers and dealers as to what material or apparatus we have been obliged to use in the work. However, it now seems advisable that, owing to the large amount of money that is being expended in this work, some experimental work should be carried on relative to the apparatus used in fighting the pests, as well as in regard to habits of the insects and their natural enemies; and we are bending our efforts at the present time to the solving of several problems which have arisen in our use of apparatus. We hope in the future to have something more effective in the way of apparatus, and also to find some improvements in the methods of doing our work. During the past spraying season it has been noted that on the large outfits the nozzles, and also the couplings in the hose which were being used, offered too much resistance to the pressure which we were trying to obtain. In spraying with large power outfits, the use of 1½-inch hose was preferable to any smaller size, from the fact

that a higher stream was obtained; but at the same time a 1½-inch hose was so heavy and clumsy that it lowered the efficiency of the men; so we have been experimenting with a coupling that will not offer as much resistance as the coupling which has been in use on smaller hose, and hope to produce something which will give us the full inch stream in inch hose.

Also, in our nozzle experiments we have succeeded in making a nozzle to be used in woodland work that will carry the stream



Pole brush with bracket, designed by State Forester's department for creosote work.

much higher than anything we have used up to date, as it has a tendency to allow the stream to go higher in the air before breaking into mist, instead of breaking almost instantly after leaving the tip, as in the old nozzle.

In the large power outfits it has seemed to us that we were not getting the efficiency that we should expect from such high-priced apparatus, and we are at the present time experimenting along these lines, hoping to produce a large outfit that will be more efficient than the ones now in use. During the next caterpillar season a series of experiments will be carried on in woodland colonies, to see if any more economical method of sup-

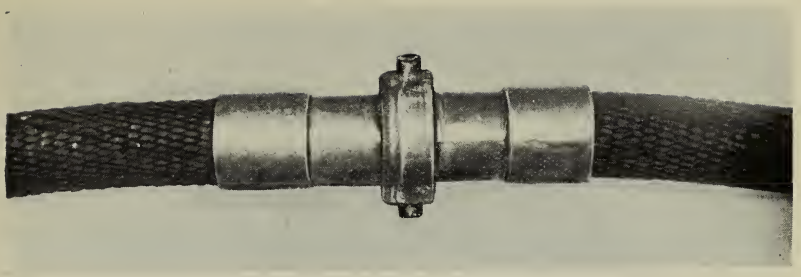


FIG. 1. — New full-way coupling.

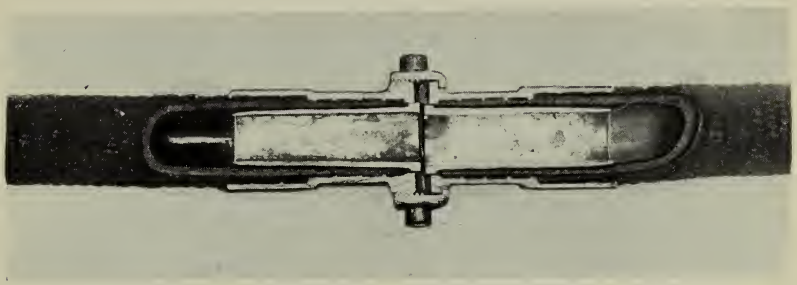


FIG. 2. — Inside and design of full-way coupling.

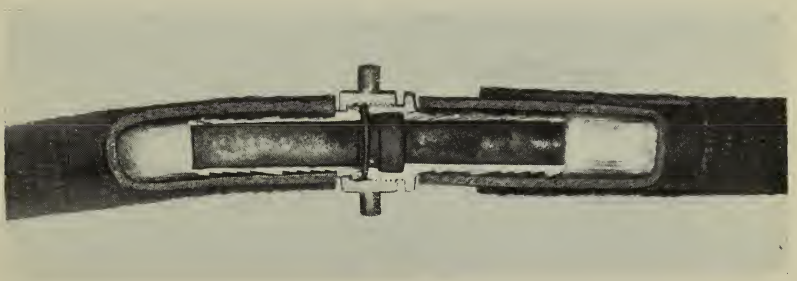


FIG. 3. — Long-tailed coupling, and resistance which it gives.

A new coupling, designed by the department of the State Forester, which will greatly advance the efficiency in spraying work.

pressive work than we are now using can be found. We have also made a bracket and holder for pole brushes, which has met with the approval of our field men.

North Shore Work.

Very little work was done from July 15 to Dec. 1, 1908, in the colonies cleared and sprayed in the spring and summer, but several woodland colonies were scouted and conditions determined for this year's work. An arrangement was made on Dec. 1, 1908, for the prosecution of the work in 1909, with funds contributed by north shore residents, through their agent, Col. Wm. D. Sohier, and this office.

The woodland colonies bordering on property already cleaned and certain areas not touched last year were the problem of this year's work. The reinfestation of cleaned estates was to be avoided by this work. About 2,138 acres were treated, — nearly double the area treated in 1908. The cost of the work this year has been about $53,000, compared to $50,000 spent in 1908, and about twice as much ground covered this year as last.

In planning our work on the north shore this year the amount of apparatus necessary had to be considered, that remaining from 1908 not being sufficient. New apparatus was purchased, and at the beginning of the spring season eight spraying machines were in readiness for the work. These machines were constantly in operation for a period of twenty-five days, including Sundays, and we did not lose more than three or four hours' time on account of bad weather. Indeed, ideal weather conditions prevailed during the whole spring and summer.

We were fortunate in securing our poison at a very reasonable price, and very few delays occurred while waiting for poison. About 55 tons of arsenate of lead were used, and the work in general was very effective. In all the 2,138 acres sprayed there were not over five which showed any defoliation during the caterpillar season. We were also fortunate in some of the colonies cleaned in 1908 in having help from the wilt disease of the gypsy moth, and here, with the good results of the 1908 spraying, conditions were gratifying.

This year protective work was done to a large extent; that is, protective belts were cleaned on the borders of large colonies where it was too expensive to care for the whole colony. The work in these belts proved effective, and we shall probably be able to handle some of the other large and badly infested areas by this method in the future.

The colony known as "Bishop's Grave" colony, on the old Manchester road, which was the only badly infested spot in that section, was cared for by means of the protective belt and the use of tanglefoot. The colony known as the "Piggery" colony, also, was treated in this manner. This colony is bounded by Crooked Lane, Preston Place and Brookwood Road, and by large estates which are being well taken care of by the owners.

Considerable thinning was done in valuable pine lots, where it was necessary that work should be done immediately, if the trees were not to be defoliated and killed during the last caterpillar season. Tanglefoot was used on colonies where the trees were largely coniferous, and the results were very gratifying.

In increasing the number of our spraying machines we found that it would be necessary to have better facilities for getting water to our sprayers. One more water cart was purchased, and also a pumping outfit, which was able to force water 1,000 feet at a 75-foot elevation, and in that way very little time was lost in filling our machines with water. This pumping outfit was an experiment, and was found to be a good investment from an economic standpoint. Consequently, we shall find it advantageous to increase this line of apparatus in the coming spraying season.

The average cost of the work on the acres which were cleared and burned was $32.88 per acre. This amount may seem excessive, but the explanation of this is, that in thinning in several of the colonies a great deal of deciduous wood was removed which made the clearing more expensive this year, but the work has put the colonies in good condition for future work.

In the spraying, over 2,138 acres were sprayed, at an average of $9.44 per acre, and the creosoting which we did on 1,756 acres cost $2.31 per acre. On the whole, the results for last season were exceptionally gratifying, and, as this piece of woodland

work is the largest of its kind ever done in this country, it is extremely interesting to note what can be accomplished where funds are available and the proper methods are applied.

The coming season a great deal of the work will be confined to roadsides, as in some of the woods, back farther from the shore than we can expect to care for, there are bad colonies reaching out to the roadsides, and in order to preserve valuable trees a strip 100 feet wide should be cleared. After consulting with the committee representing the north shore residents, we have deemed it advisable to follow out this course.

The thinning which is to be done on the north shore woodland for the coming season will be done along scientific lines, as an expert forester will be sent from this office to blaze all trees which are to be removed; this will be helpful to the men who have immediate charge of the work, as well as being a benefit to the owners of the woodlands to be thinned.

The co-operation in the work from the city of Beverly and the town of Manchester, also from the north shore residents and property owners, has been gratifying, and at no time have we been handicapped in this work by the indifference of any of the citizens in the district. We think it has been proved that in caring for woodlands it is very necessary that the best woodlands, or, in other words, the most valuable, receive the first consideration; and to care for this immense tract of beautiful woods, the most valuable of eastern Massachusetts, seems good judgment to us. The coming season we may find it desirable to work in co-operation with the city of Gloucester and the town of Hamilton, as well as with the town of Manchester and the city of Beverly, in caring for other woodland colonies which have now reached a condition where work is immediately necessary.

We give below a financial statement showing receipts and expenditures of the special north shore fund: —

SPECIAL NORTH SHORE FUND.

Dr.

To balance on hand Dec. 1, 1908,	$70 24	
cash returned for tools lost, etc.,	31 45	
Wm. D. Sohier, agent,	22,500 00	
town of Manchester,	7,500 00	
city of Beverly,	5,000 00	
cash received for work on private estates,	1,905 75	
Commonwealth of Massachusetts through this office,	22,500 00	
		$59,507 44

Cr.

By wages of employees,	$43,451 97	
travelling expenses,	467 95	
rent,	156 00	
supplies,	14,487 92	
stationery and postage,	1 17	
sundries,	209 91	
		58,774 92
Balance on hand Nov. 30, 1909,		$732 52

DANGER FROM SPRAYING WITH ARSENATE OF LEAD.

This report would not be complete without cautioning people in regard to the danger where arsenate of lead is used for spraying purposes. All of the officials in charge of spraying have been cautioned repeatedly, and wherever any spraying has been done, notices have been posted calling attention to the fact.

There is a certain amount of danger to live stock which may feed upon vegetation beneath sprayed trees. Besides posting notices, the owners of lands thus sprayed should be notified. It is recommended in so far as practicable that the sprayed section be fenced off from the unsprayed, particularly where the lands are to be used for pasture. Again, where the grass and other crops beneath sprayed trees are to be cut and used for hay or fodder, at least two good drenching rains should occur between spraying time and harvest. There seems to be little danger in feeding sprayed hay to horses in any stage, but it is quite another matter with cattle.

The experience of the past year shows that comparatively little trouble has resulted, except in cases of negligence. We

have gladly looked into every case reported, and our diagnosis has proved that most instances attributed to spraying were due to some other cause.

Last spring a bulletin from the Colorado Agricultural Experiment Station, in regard to the detrimental effect of arsenate of lead upon trees, caused much unnecessary controversy, as we have found no basis for believing it harmful under Massachusetts conditions. Trees sprayed repeatedly with a heavy solution have failed to show any detrimental effects. We understand the United States Department of Agriculture is investigating the whole subject.

As was stated last year, in the case of the alleged death of live stock from spraying operations it is important that the viscera should be removed and subjected to chemical analysis, if claim for damages is to be made against the city or town. The Honorable Auditor of the Commonwealth has ruled that claims for loss from the death of live stock alleged to be due to spraying operations, under the direction of this office, are not a proper subject for reimbursement from the appropriations for the suppression of the gypsy and brown-tail moths; but that rather they fall in the class of consequential damages, which must be borne, if at all, by the city or town in which they occur.

The Diseases of the Gypsy Moth.

During the past season a great amount of interest has centered in the diseases of the gypsy moth, owing to the prevalence of the so-called wilt disease.

This disease, alluded to in last year's report, was again taken up and studied under the direction of Dr. Theobald Smith of the Harvard Medical School. By an arrangement with Dr. Smith, one of his trusted assistants, Dr. H. N. Jones, was delegated to the work under his guidance. Dr. Jones has endeavored to determine the bacteria causing the disease, hoping to be able to spread it artificially, if found practicable.

Dr. Smith has submitted to the State Forester a detailed account of the whole season's work. It is not thought desirable that his report be published at this time, as it will take at least another season to determine any definite results. This

work will be continued the coming season, during which time Dr. Smith has every reason to believe he will be able to determine whether the disease is bacterial, or not.

Prof. W. M. Wheeler of the Bussey Institute, being interested in the subject, delegated one of his special students, Dr. William Reiff, to make a study of the effect of good and poor foods upon the gypsy moth larva. Professor Wheeler outlined some experiments, which Dr. Reiff carried on throughout the past season. The results of these experiments point to some very valuable discoveries, if they prove as effective as would appear from the first year's investigation. Dr. Wheeler, who was abroad most of the summer, very kindly went over the whole matter with the State Forester upon his return, and submitted a report of Dr. Reiff's work.

These experiments are to be continued during another season, at the end of which a substantial report will doubtless be printed. This office is to assist in the work by defraying Dr. Reiff's expenses.

Another line of investigation in progress throughout the year has been conducted by Dr. E. L. Mark, director of the Harvard Zoölogical Laboratory, to determine whether the cause of the wilt disease is due to protozoa. Dr. Mark has had Mr. Jas. W. Mavor, a special student, working under his direction since last spring. The results of this work will probably be determined this winter, as Mr. Mavor expects to shortly complete his examination of the material collected during the past season. It is hoped also that the results of this study may throw some light upon the better rearing of the gypsy moth larva at the laboratory.

Still another possible assistance in controlling the gypsy moth is through a fungous disease that was obtained by Dr. G. P. Clinton in Japan. This works on the insect just as the disease we now have works on the brown-tail. It is understood that Dr. Clinton's trip was made possible through some friend of Harvard University, who offered to finance the undertaking. This disease is now in the resting spore stage, and Dr. A. T. Speare, in charge of the work at present, hopes to establish it in the field this coming spring.

The Fungous Disease of the Brown-tail Moth.

This disease was outlined and discussed quite fully in last year's report. This past season arrangements were made with Dr. Roland Thaxter, mycologist of Harvard University, to carry on the work. Dr. Thaxter has conducted the work through his assistant, Dr. A. T. Speare, who last year assisted Dr. Clinton in work for this department. Dr. Speare was in the field early last spring, and has succeeded in placing out a large number of plantings of the disease, with very gratifying results. During last spring we furnished him with an assistant who prepared the specimens for distribution, and two climbers who distributed them. Fall plantings have also been made, and Dr. Speare feels very much encouraged over the outlook. Upon a trip taken with him this fall to examine the plantings, we found evidence that these plantings have been very effective. Not only were the artificial plantings a marked success, but the disease occurred here and there naturally, proving very efficacious.

We expect to continue this work next season, and we hope to be able to get the disease thoroughly established throughout the territory infested by the brown-tail moth.

Parasite Work.

Every thinking person must feel that the danger which the gypsy and brown-tail moths threaten to our orchards, shade trees and forests, renders it highly important that every means suggested for their suppression, which offers reasonable hope of success, should be given a faithful trial. Actuated by this feeling, and having in mind the well-established fact that in Europe, where the gypsy and brown-tail moths are natives, serious outbreaks of these insects are checked by natural enemies, the Legislature of 1905 placed at the disposal of the State Superintendent $30,000, to be expended as needed over a period of three years in the importation of parasitic and predaceous enemies of the gypsy and brown-tail moths. A sufficient amount of money has been made available by subsequent Legislatures to carry on this experimental work without interruption up to the present time.

In prosecuting this work the State Superintendent has been fortunate in having had the hearty co-operation of Dr. L. O. Howard, Chief of the Bureau of Entomology of the United States government, who is regarded as one of the best authorities in the world on parasitic work. Many other prominent entomologists, whose scientific attainments in this particular work place them in the front rank of their profession, have been here and investigated our methods of importing and distributing parasites, have given the department the benefit of their knowledge and experience, and offered such advice and made such criticisms as they thought might prove helpful. The findings of these eminent men were published in the third annual report of the State Superintendent, and in each instance were highly commendatory. Every valuable suggestion made by them was adopted and put into operation, and no stone has been left unturned which seemed to offer the slightest hope of success.

Now, after devoting nearly five years to this work, involving an expenditure of nearly $75,000, it is pertinent to ask at this time if the results obtained are commensurate with the cost, and if the prospect for the future will justify the Commonwealth in continuing its efforts in this direction.

In order to answer this question intelligently, and to meet the general demand of the citizens of Massachusetts for exact information concerning the progress made in this important branch of the work, the State Forester, to whom by an act of the last General Court was given the superintendency of work against the gypsy and brown-tail moths, has devoted considerable time to an investigation of the parasite work, to determine, if possible, if everything is being done which can reasonably be expected along this line. As a result of that investigation, taking into consideration the difficulties in importing, breeding and disseminating foreign insects, as well as the long time required for them to become established under the most favorable conditions, I am fully convinced that the progress made thus far shows very gratifying results, and expectations for the future certainly justify a continuance of the work with unabated vigor.

The importation and breeding of the *Calosoma sycophanta* beetles, of which much has been said in previous reports, has

been continued during the past year with very gratifying results. In the fall of 1908 a stock of adult beetles was placed in hibernation at the laboratory, and about the 1st of June, 1909, the work of rearing larvæ for field colonies was begun. This work was so successful that it was possible to liberate 6,100 larvæ during the season. The places selected for these plantings were in woodland areas badly infested with the gypsy moth, extending as far north as Gloucester, Manchester and Essex, as far south as Quincy and as far west as Concord.

The total number of colonies planted were 33, 32 in the larval stage, and 1 colony of adult beetles which were imported. Observations made of the colonies planted in previous years revealed a very satisfactory increase, and in some sections it was found that the beetles had spread over several square miles. To guard these beetles from the danger of being destroyed by people unfamiliar with their appearance, the State Forester caused warning notices, bearing pictures representing the insect in the several stages of its life history, to be posted in libraries, post-offices and school buildings throughout the moth-infested area of the State, and it is his purpose to issue cards in the near future, showing the insects in their natural colors. Efforts will be made the coming season to materially increase the numbers of these valuable insects, by importation and breeding.

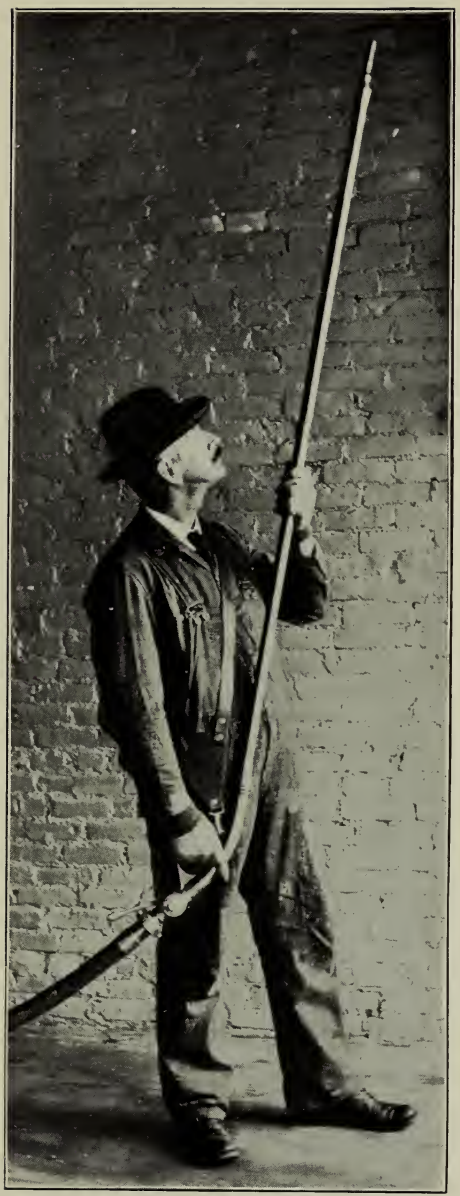
The following information on five important insects in which we already have great faith in establishing a balancing condition of the gypsy moth in Massachusetts, has been given me by Mr. W. F. Fiske of the laboratory: —

Anastatus bifasciatus. — This insect parasite attacks newly deposited eggs of the gypsy moth during the brief interval which elapses before the embryonic caterpillars develop. Its eggs are deposited singly, one in each individual egg of the host, and its larvæ feed upon the substance of the host himself, and become full-fed in about three weeks. They then enter on a long resting stage, snugly ensconced within the limited confines of the shell, and do not resume activity until the middle of the following summer, ten months later. The transformations to pupa and adult follow in the course of two or three weeks following, and the latter emerge, and in a few days are ready to deposit eggs for another generation within the newly deposited eggs of the next generation of the gypsy moth. There is thus but one generation of the parasites each year, and its life cycle, which corresponds to

the annual cycle, is correlated exactly with that of the insect which serves as its host. Encouraged by the knowledge that there was an egg parasite which could be secured through a winter importation of eggs, — a fact which was far from being established up to the rearing of the first specimens of *Anastatus,* — larger importations from various localities were made during the winter of 1908 and 1909. From some of the shipments by far the largest number of parasites ever received from any source was secured, there being nearly 90,000 all told. These 90,000 were liberated in 5 colonies, quite widely separated, within the infested area. In each instance they attacked freshly deposited eggs of the gypsy moth with avidity, and multiplied in the field under perfectly natural conditions. At the present time there are many colonies of larvæ of the parasites hibernating in the open in the immediate vicinity of the colonies, exactly as they would do in their native land, and there cannot be any question that they will issue next summer in the normal manner.

Another egg parasite, *Schedius kavanæ,* is one which will be described at length in a bulletin soon to be issued. There were 26,000 liberated in September and October. After September the bulk of these were reared for extensive propagation work at the laboratory, and at the present time a conservative estimate of the number in various stages in the reproduction cages is 2,000,000. It is by no means sure that the species will be carried through the winter as successfully as is hoped will be the case, but no obstacle threatens to prevent the liberation of parasites during the summer of 1910. The prospect seems bright for the establishment of strong colonies in each city and town in the infested district during the coming summer, and, if the same rate of dispersion indicated during the past fall continues, and the parasite demonstrates its ability to exist under American conditions during the entire year, it should be generally established in the infested area in two or three years more.

Glyptapanteles fulvipes. — This parasite deposits its eggs beneath the skin on the caterpillars at any stage from the first to and possibly including the last. The larvæ hatching from the eggs become full grown in from two to three weeks, and then work their way out through the skin of the still living caterpillar within the body of which they have fed. Each spins for itself immediately afterward, for its better protection during its later stages, a small white cocoon. The unfortunate victim of attack does not as a rule die immediately, but it never voluntarily moves from the spot. Its appearance both before and after death, surrounded by and seeming to brood over the cocoons, is peculiar in characteristic, and once seen can never be mistaken. There is ample opportunity for two generations annually of the parasites from one generation of the gypsy moth. This is the rule in the countries to which it is native, and it is to be expected in America.



Long woodland nozzle with strap attached, shut-off and shoulder strap, designed by State Forester's department for high, solid, straight stream spraying.

Blepharipa scutellata is a very important parasite of the gypsy moth in Europe, and in western Europe appears to be very much more destructive than does the *Glyptapanteles*. For the first time since the inception of the parasite work large numbers of living puparia, containing the immature maggots of these parasites, were received at the laboratory, and it was possible to allow the formation of the puparia under natural conditions in the earth. A very large number of parasites were secured in this manner (25,000 is a conservative estimate), and several thousands of maggots were allowed to enter the earth in the open in forests infested by the gypsy moth.

Examination has demonstrated the fact that the maggots pupated in a perfectly natural manner, and the condition of pupæ at the present time is far and away more satisfactory than it has ever been before at this season of the year. It is almost impossible to conceive of conditions which will prevent the emergence of these flies in large numbers in the open the coming spring.

Monodontomerus aerus. — This parasite attacks and destroys the freshly formed pupæ of the gypsy and brown-tail moths by depositing eggs on the inside. These eggs hatch, and the larvæ feed and subsequently undergo all of their transformations within the pupa shell, of which they usually consume the entire contents. This parasite was first imported and liberated in 1906, and multiplied so rapidly in the field that it is now known to be distributed over an area of approximately 3,000 square miles.

Owing to the fact that it is my intention to issue in the near future a bulletin treating at length of the large number of foreign insects that have been imported and experimented upon, as well as describing in detail the work being done at the laboratory, I have mentioned here only those imported natural enemies of the gypsy and brown-tail moths that close observation in the field leads the government experts to believe are now well established, and that give promise of becoming important factors in checking the pests we are engaged in fighting. In addition to these, many other species have been imported and liberated; and, notwithstanding the fact that up to this time we have no evidence of their survival, this cannot be considered conclusive, as history records several instances of the introduction of foreign insects which apparently died out, but after a long lapse of time suddenly became noticeable and did very effective work.

In closing my report on this important branch of our work,

I desire to impress upon the tax payers and citizens of Massachusetts that, while the outlook for ultimate success seems bright, they must not expect immediate and sweeping results, as these natural enemies will of necessity be slow in demonstrating their effectiveness, — just how long, no man can determine with any degree of certainty. We have, as an example of the multiplication and spread of a foreign insect, the gypsy moth itself, which had been in this country nearly twenty years before it became abundant enough to attract general attention. Therefore, it must be quite obvious to all who give it any thought that, although many of the parasites multiply prodigiously, it will require several years for them to become numerous enough to serve as a material aid in suppressing the gypsy and brown-tail moths.

Incidentally, it may be said that there is a parasite working upon the elm-leaf beetle, which ultimately promises very good results.

I desire to express my grateful appreciation of the conscientious efforts of the expert men from the United States Bureau of Entomology, who have been engaged in this experimental work, — Mr. W. F. Fiske, who has had charge of the laboratory work since 1907; Mr. A. F. Burgess, to whom was assigned the work on predaceous beetles; Mr. C. H. T. Townsend, who has conducted the experiments on the Tachinid parasites; as well as Mr. F. H. Mosher of the State department, who has been connected with the laboratory since its establishment in 1905. These men, together with their able corps of assistants, are entitled to a great deal of praise for their untiring efforts to attain success.

Parasite Appropriation.

This appropriation has been used during the year for importing larger numbers of parasites into this country than ever before. Both the importations from Japan and Europe have not only been larger, but were received in far better condition. Prof. Trevor Kincaid, the same gentleman whom we sent to Japan with such good results last year, was commissioned to go to Russia and other European points this past season in quest of parasites. The results of this trip were not, on the whole,

as satisfactory in point of securing material as was the Japan trip; however, it is yet early to predict.

The State Forester has not hesitated to make expenditures from the appropriation where the probability of securing desirable results seemed to warrant them. The total expenses incurred in this work during the year 1909 are as follows: —

Balance from 1908,	$18,930 09	
Appropriation of May 19, 1909,	15,000 00	
		$33,930 09
Expenditures: —		
Wages of employees,	$8,705 73	
Travelling expenses of employees,	2,493 77	
Rent,	369 00	
Supplies,	1,749 65	
Stationery and postage,	165 55	
Printing,	34 25	
Sundries,	806 16	
Importation of parasites,	8,075 52	
		22,399 63
Balance Nov. 30, 1909,		$11,530 46

Report of Dr. L. O. Howard, Chief of the Bureau of Entomology, Washington, D. C.

United States Department of Agriculture,
Bureau of Entomology, Washington, D. C., Dec. 29, 1909.

Prof. F. W. Rane, *State Forester, 6 Beacon Street, Boston, Mass.*

Sir: — I have the honor to submit a brief report of the share of the Bureau of Entomology in its co-operative effort with the State of Massachusetts to import foreign parasites of the gypsy and brown-tail moths into Massachusetts during the period since I submitted my report to Mr. L. H. Worthley, Jan. 4, 1909, and which has been published in Public Document No. 73 of the State of Massachusetts.

Respectfully yours, L. O. Howard, *Chief of Bureau.*

Before beginning a brief account of the operations carried on, the writer desires to express his entire satisfaction with the outcome of the co-operation between the State and the United States Department of Agriculture. The relations between the persons engaged in this work in both branches have been of the most cordial character; the understanding has been perfect. The work of the experts of the Bureau has been facilitated in the most intelligent and courteous way by

the officials engaged in the State work, and it is difficult to conceive of any arrangement which, on account of this intelligent and cordial co-operation, could have been better arranged to bring about the important results expected.

The foreign work for the season was planned during the winter of 1908–09, and instructions were given, so far as possible by correspondence, to European paid and voluntary agents. Brown-tail nests containing parasites were imported from many parts of Europe, and active laboratory work was carried on at Melrose Highlands, in the course of which, largely through the ingenuity of Mr. Fiske, many new points of practical importance were developed. In addition to brown-tail nests, egg masses of the gypsy moth were imported during the winter and spring, and from especially large numbers of these egg masses sent from Hungary by Prof. Josef Jablonowski there were reared an astonishing number of an important species of egg parasite.

Realizing from past experience the comparatively unsatisfactory results which follow in this particular work from correspondence alone, even with highly trained and most intelligent observers, as compared with personal conversations, in which doubtful points can be considered at length, the writer in May and June visited Europe for the purpose of forwarding the work. As shown in the last report, it had not been considered necessary for him to visit Europe in 1908, and the funds thus saved were devoted largely to the organization by Prof. Trevor Kincaid of a parasite service in Japan, which has been described in the previous report so far as its results for the summer of 1908 were available at that time. On the present trip the writer started forwarding agencies for parasites at Cherbourg, France (a much more convenient and surer locality than the 1908 station at Rennes), and at Hamburg, Germany. He arranged at the former place with the authorities of the University of Rennes to have Mr. A. Vuillet of Rennes, agent of last year, stationed at Cherbourg during the shipping season, and through him were forwarded all parasitized material coming from France, Switzerland, Holland and Italy. At Hamburg the United States Express Company was constituted the forwarding agent for the service, with the expert advice of Dr. L. Reh of the Hamburg Museum, to act in case of broken packages or damaged material of any kind. Agents and officials were then visited in Holland, Germany, Russia, Austria, Hungary, Switzerland, and again in France. The European situation was thoroughly studied, and the result of the trip was the securing of largely increased sendings of parasitized material from many points.

In the autumn of 1908, after Prof. Trevor Kincaid's return from his very successful trip to Japan, the writer visited Seattle, Wash., in the course of an official trip to the coast, and discussed with Professor Kincaid the advisability of a second expedition to Japan dur-

ing the summer of 1909. Although his trip had been of such an agreeable nature as to make him greatly desire a good excuse for a second trip, Professor Kincaid, nevertheless, was of the opinion that the Japanese government and the Japanese entomologists had shown such a great courtesy and such a profound interest in the work that it would not be necessary to send an American agent again, but to throw the work upon the courtesy of the Japanese. Therefore, after a preliminary correspondence between the Secretary of Agriculture of the United States and the Minister of Agriculture of Japan, Prof. S. I. Kuwana was designated by the Japanese government to be its official representative in the work to be carried on in Japan during the summer of 1909, and he was directed to place himself in correspondence with the writer. Professor Kincaid's assurances and the writer's expectations have been abundantly justified. Professor Kuwana, a man of already established high reputation, has shown himself in the work to be one of the highest order of intelligence and resourcefulness and of indomitable energy and perseverance, and his work for the summer resulted in the receipt of material of large value at the Melrose Highlands laboratory. The warm thanks of the United States government and that of the State of Massachusetts should be given to the Japanese government and to its agent, Professor Kuwana.

As a result of the writer's trip to Russia in 1907, a service was established in that country which resulted in the securing of interesting material from Prof. W. Pospielow of Kieff, from Dr. Isaac Krassiltchik of Kishinieff and from Prof. S. Mokschetsky of Simferopol, all of whom have official connections with the Ministry of Agriculture and Forestry at St. Petersburg. This material continued to arrive during the summer of 1908, and, as there were reared from it certain parasites which seemed of considerable potential value, but which, on the other hand, were not received in the best possible condition, it was considered desirable to send an American agent to Russia during the proper season of 1909, for the purpose of endeavoring to secure more material, in better condition. Professor Kincaid, on account of the success of his 1908 expedition to Japan, was requested to do this work; and, securing leave of absence from the University of Washington, through the courtesy of its president, he sailed for Europe in April. He was cordially received by the Russian government, whose permission for the visit had been granted in advance, and after consultation with the officials located himself for the best part of the rearing season in favorable locations in Bessarabia, continuing sendings, which, however, on the whole were disappointing in their character on receipt at Melrose Highlands. The problem of securing in New England material from Russia in the best possible condition has not yet been solved.

The best material was received from France. Upon his arrival in Paris, on the 13th of May, the writer met by appointment Mr. René

Oberthür of Rennes, a French entomologist of the highest standing and one of the world's great amateur collectors, and certain of his collaborators. Mr. Oberthür has taken up this work voluntarily as a private citizen of France, wholly without compensation, and entirely from his scientific and practical interest in a great piece of experimental work. The warm thanks of the United States and particularly of the New England States are due to this remarkable man. Plans were considered, largely at his suggestion, which resulted in the establishment of a very large-scale service, principally in the south of France, and in the employment of a large number of collectors under expert supervision. Through this arrangement several thousands of boxes of excellent material were received at the Melrose Highlands laboratory from the south of France. In quantity it exceeded the total of all other importations made since the beginning of the work, and from it have been reared a greater number of Tachinid parasites than have been reared from all other importations of this kind put together.

As a matter of course, quantities of miscellaneous material have been received as formerly from numerous paid and voluntary collectors in the other countries mentioned in an earlier paragraph. On the American side the organization of the laboratory has continued as outlined in the last report. In the autumn Prof. C. H. T. Townsend was given an eighteen-months leave of absence, to enable him to accept a temporary employment with the Peruvian government; but his work has been continued by expert assistants, under the supervision of Mr. Fiske.

During the season there have culminated in a remarkable manner the results of the experience, hard work and experimental efforts of the previous years; methods have been bettered and insight has been gained not only into the habits of the different species, but into important matters like modes of dispersal, which place the attempt upon a very satisfactory basis, and which enable more positive predictions than the workers have been heretofore inclined to make. During the autumn a more extensive effort than previously was made to determine exact field conditions. This involved extensive scouting over large territories, and the dispersal of several important species has been found to have been much more extensive than had even been hoped. The general features of this work will shortly be published in a bulletin by Mr. Fiske, to be issued from the office of the State Forester; and a more detailed consideration of the whole situation is under preparation, under the dual authorship of the writer and Mr. Fiske, which will appear as a bulletin of the Bureau of Entomology. Plans for next year's campaign are already advanced.

Future Work.

The work to be done during the fiscal year 1910 against the gypsy and brown-tail moths by cities and towns should be carried on along similar lines and methods as last year, but with a clearer and more definite comprehension and understanding of it. It may be advisable in winter work against the pests to give the gypsy moth the preference, as its ravages are much more severe. In cases where the infestation is in outlying districts and in large orchards, where owners are receiving great financial benefit from the work, it is generally conceded to be the owner's duty to remove the brown-tail webs from his trees; but it is best to allow the town forces to care for the gypsy moth egg clusters, where the owner is not familiar with the treatment of them. Woodland work should be made of a protective nature, as far as possible. Where woodland work is necessary, it should be done along scientific forestry lines.

The use of tanglefoot should be given the preference over burlap where it is possible, except on street trees; but even on street trees it may be used to advantage in urgent cases. Where trees are near stone walls and fences which are badly infested with the gypsy moth egg clusters, the trees should be tanglefooted as early as is practicable in the spring, and in that way the caterpillars driven to seek food farther away from their hiding places in the wall and fences, the infestations thus becoming lighter and more scattering. Also in the congested residential sections of cities and towns, where conditions are unsanitary and estates badly infested (bad spots in which to get thorough work from employees), tanglefoot should be applied to shrubs and trees, and thus the caterpillars be driven to other places for food, or starved to death. This will be found to be a very economical plan. In using tanglefoot, it is very necessary that it be combed a few times during the season, as this keeps the surface sticky. There have been some places where tanglefoot has been thought injurious, but thus far this office has not been able to authenticate any such cases. However, it is well to beware of sticky materials that have not been tried and proved to be harmless.

Great care must be taken at the beginning of the spraying season to choose the places where spraying will be most effective. We must always bear in mind that one method must follow another, in order to make our work show results; for, as it has been determined that no one parasite can keep the gypsy moth in check, so also no one method alone will prove effective in suppressing the insect pests.

We must take into consideration at this time that our law does not include work against the elm-leaf beetle, and our apparatus should not be used in fighting this pest, as the law does not authorize any expenditure on this account. Local gypsy moth superintendents who are also tree wardens should bear this in mind, and see that a special appropriation is made to cover such work.

Proposed Amendment to Gypsy and Brown-tail Moth Law.

Section 5, chapter 381, Acts of 1905, should be amended by striking out the last paragraph, beginning, "In case of emergency," etc., and substituting for it the following paragraph: —

> The state forester may assess cities and towns for such an amount as they may be required to expend by the provisions of this act, or for such part of it as he may think necessary, the amounts thus assessed to be returned to the state treasurer after sixty days, and credited to the appropriation for carrying out the provision of this act. The work to be done in such cities and towns shall be under the direct supervision of the state forester.

The reasons for asking for the above amendment are as follows: —

More efficient work could be done in various outside towns, where the infestation is not severe enough to warrant the keeping of a permanent force all the year round, if the necessary work should be done under the direct supervision of this office, by a permanent force made up of picked men from the several towns in which the work is to be done. In such places it has been the custom to employ men for not more than four months in the year, and therefore it was necessary to break in new men each season. These new men of course cannot do as efficient work as experienced men.

This amendment would also enable us to do work in towns where appropriations cannot be made at the beginning of our fiscal year, which is December 1; the fiscal year of most towns begins January 1. In some towns and cities appropriations have been delayed and the work stopped, with serious consequences. Thus, in towns or cities where appropriations are not available, this office could take up the work with a competent force of men, carrying it on until such time as the city or town authorities were ready to continue it. The town or city would be assessed the total amount spent, and this amount paid in to the State Treasurer and credited to this office.

In cases where there is delay over the selection of the local superintendent, this amendment would give this office the right to step in and carry on the work until such time as the authorities should appoint a competent man to go on with the work.

The Elm-leaf Beetle.

In recommending an appropriation for elm-leaf beetle work, we feel in many cases it could advantageously be combined with our work against the gypsy and brown-tail moths. In using arsenical poisons against leaf-eating insects there are certain times during the spring season when best results are obtained, and this time for spraying is the same for the elm-leaf beetle as for the gypsy moth. It would necessitate in many places the purchase of more apparatus, but the work would be done with greater thoroughness.

One thing, however, is certain: we should not include the elm-leaf beetle spraying with the moth work, unless an appropriation is made, sufficient to take care of it. We should not be handicapped in the moth work, particularly in the coming year, just when we are prepared to accomplish effective results, provided the usual appropriations are made. The elm-leaf beetle, it must be remembered, is found not only throughout the eastern part of the State, where the moth work is confined, but over the whole State, and it needs extra financial assistance to handle it.

Dead Trees should be cut and utilized to minimize Insect Troubles.

Trees that have died from any cause whatever should be dug up, or cut down and used. This is particularly advisable where there are trees of the same species. The reason for this is the great unbalancing of nature. There are many insects that live under the bark or bore into dead trees, which never trouble us. However, under favorable conditions they multiply so fast that they are likely to confine their work not to dead trees alone, but will doubtless attack live trees, thereby doing great damage. These insects are usually found just inside the bark; hence, if the bark is stripped off and burned any time before April, they would be destroyed. It is hoped that our people will keep this suggestion in mind, and practise it as much as possible. The cities of Cambridge and Somerville, for example, should cut and destroy the bark on the dead elms this winter; and where trees have been killed by the gypsy or brown-tail moths, they should be cut and utilized at once. Not only will it reduce the possible danger, but the product itself will be more valuable.

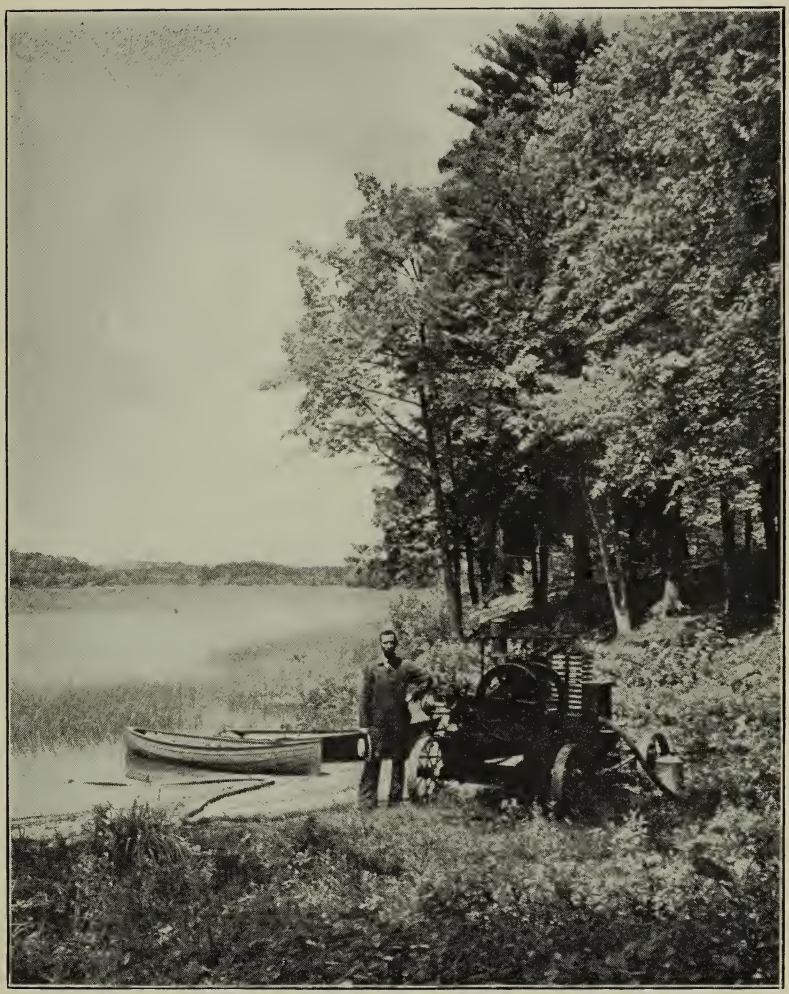
Modern Forestry and Insect Warfare.

The more the subject of modern forestry is studied, the clearer is it shown that if forestry practice was carried on as it should be for economic results, the great expense we now are compelled to make in fighting insect pests like the gypsy moth would be reduced to a minimum.

Where gypsy moths give us the greatest trouble is in wild neglected woodlands, and in thickets and tangles found along the highways or on illy kept estates.

One thing which our people cannot help but recognize is, that where modern methods have been practised through thinning and exercising some sort of management for the good of the trees, here conditions are not as bad as elsewhere. Then, again, under the latter management should the infestation increase, the conditions are so much more favorable that the expense of warfare against the pest is greatly reduced.

It is really possible that the gypsy moth scourge may cause



Gasoline force pump used in woodland spraying, furnishing water 1,000 to 1,500 feet from spraying machine, pumping 400 gallons in eleven minutes.

certain sections to practise modern forestry, and thereby in the end gain financially in getting a better forest product, both in volume and quality, than would have happened had the insects never appeared.

From the experience already gained we have demonstrated that where we have a clean stand of pine the forest can easily be protected against the gypsy moth. There are few species of forest products worth more than white pine to grow commercially at present here in Massachusetts. What is true of the pine is more or less true of other evergreens; hence, in the territory infested by the gypsy moth it is good forestry to grow these species.

The first thing to be done with all woodlands, therefore, is to practise modern forestry management for the benefit of future products, regardless of gypsy moths or other depredations; then, let come what may, conditions are of the best to overcome them.

There is little to be gained in treating egg clusters and combating moths on dead or ill-shaped and weed trees and stumps, as one's efforts ought to be centered on those that have prospective value.

We recommend, therefore, that every one begin at once to practise modern forestry management, and then the insect warfare will be greatly reduced.

Financial Statement.

General Appropriation.

In our financial statement, given below, we show a balance of $4,143.05. This balance will be disbursed during the current month in reimbursements to towns and cities which have not yet returned final papers of the year's expenditures to this office. There are, as usual, a number of dilatory municipalities, from which it is almost impossible to get returns at the proper time.

Balance from 1908, ...	$1,223 37	
Appropriation for 1909, ...	150,000 00	
Amount returned by town of Winchester,	297 06	
Amount returned for tools lost, . .	8 40	
Appropriation of May 19, 1909, . .	150,000 00	
		$301,528 83

Office expenses: —		
Salaries of clerks,	$2,429 00	
Rent,	1,801 67	
Stationery and postage,	884 53	
Printing,	497 46	
Experts,	95 24	
Supplies and furniture,	443 20	
Sundries,	1,168 93	
Educational work,	45 61	
Field expenses: —		
Wages of employees,	35,823 55	
Travelling expenses,	11,852 98	
Supplies,	3,048 97	
Special work in parks, etc.,	22,521 50	
Supplies for experiment,	7 71	
Sundries,	165 25	
Reimbursement to cities and towns,	216,600 18	
		$297,385 78
Balance on hand Nov. 30, 1909,		$4,143 05

Analysis of Town Expenses.

In the table below we show the apportionment of town expenses in the 98 cities and towns receiving reimbursement from the State to the amount of $180,849.13: —

Total amount spent,	$509,008 06	
Private work deducted,	95,626 74	
		$413,381 32
Pay roll,	$290,652 70	
Teaming,	22,893 01	
Travel,	959 00	
Rent,	799 93	
Supplies,	91,175 62	
Sundries,	4,261 72	
Stationery and postage,	1,450 66	
Printing,	1,188 68	
		$413,381 32

Financial Summary by Towns.

The following table shows the reimbursement paid to cities and towns for 1907 and 1908, the total net expenditure, the required expenditure before receiving reimbursement and the

amount of reimbursement paid in 1909, and also the required expenditure for 1910. The column for 1908 includes some reimbursements for 1908 which we were not able to give at the time the report for 1908 went to press, as the final papers were not then filed by the towns.

	1907. Reimbursement.	1908. Reimbursement.	1909.			1910. Required Expenditure.
			Required Expenditure.	Total Expenditure.	Reimbursement.	
Abington,	–	$1,493 44	$1,118 96	$1,915 24	$796 28	$1,175 93
Acton,	$2,257 82	2,485 81	722 99	2,487 26	1,764 27	782 26
Amesbury,	–	378 10	2,348 81	2,091 24	–	2,434 83
Andover,	1,020 57	2,365 17	2,476 21	6,345 65	3,095 55	2,588 47
Arlington,	5,993 94	6,109 09	4,442 02	10,606 09	4,931 26	4,591 97
Ashby,	–	–	198 77	17 50	–	212 71
Ashland,	326 15	341 24	470 02	519 33	49 31	477 13
Attleborough,	–	–	5,000 00	370 30	–	5,000 00
Avon,	–	–	377 28	–	–	384 84
Ayer,	–	–	815 53	–	–	835 41
Barnstable,	–	–	2,277 15	–	–	2,317 10
Bedford,	6,040 25	9,466 72	520 30	5,129 15	4,608 85	522 90
Bellingham,	–	–	325 46	–	–	335 96
Belmont,	3,161 87	572 93	2,431 46	2,636 85	164 32	2,511 51
Berlin,	64 87	460 83	223 62	586 57	362 95	221 62
Beverly,	1,622 45	1,889 61	5,000 00	6,636 87	818 44	5,000 00
Billerica,	3,311 50	6,091 09	909 78	5,148 44	4,238 66	974 32
Bolton,	222 38	411 07	198 02	884 67	686 65	199 14
Boston,	10,000 00	2,500 00	5,000 00	43,139 39	10,000 00	5,000 00
Bourne,	–	1,489 01	1,356 60	2,148 21	791 61	1,641 55
Boxborough,	916 28	1,805 43	99 58	1,538 05	1,438 47	106 79
Boxford,	1,361 91	2,066 35	479 97	3,323 53	2,843 56	520 74
Braintree,	–	1,445 27	2,319 73	–	–	2,421 92
Brewster,	–	–	210 63	–	–	246 40
Bridgewater,	–	–	1,300 09	1,445 47	143 48	1,328 11
Brockton,	–	–	5,000 00	–	–	5,000 00
Brookline,	–	–	5,000 00	–	–	5,000 00
Burlington,	3,835 94	5,599 44	246 52	2,534 43	2,287 91	250 36
Cambridge,	380 50	–	5,000 00	88 78	–	5,000 00
Canton,	–	–	1,596 06	600 00	–	1,654 31
Carlisle,	3,111 33	5,485 58	176 58	3,126 41	2,949 83	182 89
Carver,	96 47	3,641 27	558 34	1,725 98	1,167 64	601 89

	1907. Reimbursement.	1908. Reimbursement.	1909. Required Expenditure.	1909. Total Expenditure.	1909. Reimbursement.	1910. Required Expenditure.
Chelmsford,	$3,016 93	$3,740 98	$1,635 35	$3,693 20	$2,057 85	$1,809 64
Chelsea,	–	–	5,000 00	–	–	5,000 00
Clinton,	–	–	3,218 88	2,154 27	–	3,309 63
Cohasset,	226 02	936 40	2,817 53	6,814 73	3,197 76	3,061 17
Concord,	3,521 91	5,169 66	2,551 71	9,046 44	5,195 79	2,716 27
Danvers,	5,446 59	6,441 71	2,352 60	4,871 10	2,318 50	2,404 85
Dedham,	–	–	5,000 00	822 53	–	5,000 00
Dennis,	–	–	475 87	–	–	489 60
Dover,	1,636 79	1,487 56	560 85	3,445 46	2,884 61	2,131 26
Dracut,	397 22	2,462 61	919 20	2,137 25	1,218 05	939 68
Dunstable,	698 40	544 67	119 46	1,057 70	938 24	131 58
Duxbury,	908 00	3,381 91	1,025 48	1,776 77	857 39	881 61
East Bridgewater,	752 67	3,945 78	786 16	1,688 43	902 27	831 45
Easton,	–	–	2,031 17	851 76	–	2,115 65
Essex,	1,776 57	2,096 22	436 53	1,536 50	1,099 97	456 91
Everett,	–	–	5,000 00	2,268 40	–	5,000 00
Falmouth,	–	–	3,201 00	–	–	3,243 69
Fitchburg,	–	–	5,000 00	–	–	5,000 00
Foxborough,	–	–	883 73	–	–	911 11
Framingham,	1,161 04	–	4,035 02	3,396 27	–	4,226 59
Franklin,	–	–	1,476 97	–	–	1,517 82
Gardner,	–	–	2,942 78	–	–	3,071 08
Georgetown,	638 94	1,151 67	412 67	2,468 33	2,055 66	410 16
Gloucester,	753 14	2,063 54	5,000 00	6,895 12	947 56	5,000 00
Grafton,	–	–	1,069 86	625 52	–	1,067 88
Greenfield,	–	–	3,645 72	–	–	3,853 77
Groton,	–	–	1,235 99	1,432 71[1]	–	1,515 70
Groveland,	903 70	1,711 10	466 03	2,134 79	1,668 76	465 07
Halifax,	601 15	2,237 83	205 39	1,027 28	821 89	213 70
Hamilton,	2,246 69	3,167 63	1,441 27	2,570 49	1,129 22	1,519 37
Hanover,	1,387 34	4,054 60	577 74	1,866 80	1,289 06	591 95
Hanson,	430 18	1,871 39	511 66	1,203 45	691 79	431 80
Harvard,	–	616 61	481 67	1,230 07	748 40	493 48
Haverhill,	–	1,131 62	5,000 00	5,573 03	286 52	5,000 00
Hingham,	1,994 80	1,877 15	2,307 82	3,307 82	1,000 00	2,441 02
Holbrook,	–	–	567 83	–	–	580 26
Holden,	–	–	600 78	–	–	651 99

[1] No private work submitted.

	1907. Reimbursement.	1908. Reimbursement.	1909. Required Expenditure.	1909. Total Expenditure.	1909. Reimbursement.	1910. Required Expenditure.
Holliston,	–	–	$630 30	–	–	$663 04
Hopedale,	–	–	2,077 55	–	–	2,096 12
Hopkinton,	$166 83	$810 16	618 44	$961 93	$343 49	631 34
Hudson,	1,259 63	999 59	1,403 84	1,411 30	7 46	1,570 08
Hull,	–	–	2,070 90	–	–	2,161 33
Hyde Park,	–	–	5,000 00	2,468 25	–	5,000 00
Ipswich,	1,763 08	1,757 80	1,744 32	2,981 01	1,236 69	1,914 70
Kingston,	–	861 00	623 16	1,512 80	889 64	640 91
Lakeville,	–	–	270 16	–	–	280 54
Lancaster,	–	–	1,461 23	–	–	1,656 83
Lawrence,	–	–	5,000 00	–	–	5,000 00
Leicester,	–	–	944 95	7 00	–	965 45
Leominster,	–	–	4,210 52	–	–	4,788 85
Lexington,	10,796 87	11,139 99	2,753 87	9,387 09	5,306 58	2,903 12
Lincoln,	2,785 69	5,000 00	1,124 13	3,208 31	2,084 18	1,216 10
Littleton,	287 44	1,716 01	412 83	1,463 88	1,051 05	428 94
Lowell,	–	120 42	5.000 00	3,868 95	–	5,000 00
Lunenburg,	–	81 34	422 49	385 39	–	441 06
Lynn,	7,748 30	1,133 22 3,084 27	5,000 00	2,757 32	–	5,000 00
Lynnfield,	3,274 38	2 982 45	311 21	1,841 44	1,530 23	312 84
Malden,	2,683 57	–	5,000 00	4,455 17	–	5,000 00
Manchester,	–	–	5,000 00	–	–	5,000 00
Mansfield,	–	–	1,198 63	–	–	1,580 27
Marblehead,	–	–	2,987 21	2,750 59	–	3,101 54
Marion,	–	–	1,148 28	–	–	1,763 45
Marlborough,	855 44	580 83	4,021 23	4,483 66	369 94	4,128 37
Marshfield,	170 37	2,389 25	745 86	1,570 47	824 61	767 20
Mashpee,	–	104 77	80 22	519 27	439 05	87 88
Maynard,	1,072 06	1,551 28	1,513 59	2,167 89	654 30	1,548 29
Medfield,	–	–	617 18	–	–	638 60
Medford,	3,117 68	4,006 11	5,000 00	14,681 01	4,000 00	5,000 00
Medway,	–	–	538 39	320 66	–	579 19
Melrose,	1,354 96	1,500 00 [1]	5,000 00	2,359 70	–	5,000 00
Mendon,	–	–	259 38	–	–	291 48
Merrimac,	189 40	1,598 02	489 88	1,988 09	1,498 21	498 68
Methuen,	1,770 79	3,334 00	2,368 39	4,141 80	1,776 41	2,453 32
Middleborough,	–	–	1,811 04	2,188 50	377 46	1,885 95

[1] Special.

	1907. Reimbursement.	1908. Reimbursement.	1909. Required Expenditure.	1909. Total Expenditure.	1909. Reimbursement.	1910. Required Expenditure.
Middleton,	$1,591 44	$2,012 23	$307 67	$1,545 12	$1,237 45	$316 51
Milford,	–	–	2,800 46	–	–	3,485 24
Millbury,	–	–	920 07	–	–	917 32
Millis,	–	–	320 32	–	–	398 03
Milton,	–	–	5,000 00	9,700 00	–	5,000 00
Nahant,	–	–	2 373 87	–	–	2,451 60
Natick,	2,928 64	4,613 56	2,899 84	3,669 38	615 63	3,133 48
Needham,	364 78	2,443 84	2,262 22	3,516 51	1,254 29	2,322 78
Newbury,	1,902 35	5,187 19	499 53	3,705 81	3,206 28	492 99
Newburyport,	–	–	4,581 48	–	–	4,907 89
Newton,	761 36	2,730 67	5,000 00	36,438 69	8,000 00	5,000 00
Norfolk,	–	–	322 73	–	–	331 80
North Andover,	–	3,238 23	1,850 27	4,895 35	3,045 08	1,841 44
N. Attleborough,	–	–	2,094 98	525 20	–	2,737 98
North Reading,	1,915 81	2,757 26	270 66	3,077 94	2,807 28	542 32
Northborough,	–	–	530 72	–	–	1,744 38
Northbridge,	–	–	1,699 24	–	–	280 65
Norwell,	507 41	2,291 57	346 80	1,366 50	1,019 70	367 98
Norwood,	–	–	2,440 26	1,200 00	–	5,000 00
Orleans,	–	–	245 67	–	–	252 53
Oxford,	–	–	747 67	–	–	775 25
Palmer,	–	–	1,629 01	–	–	1,671 17
Peabody,	3,997 42	4,208 67	4,039 62	6,162 57	1,698 36	4,156 73
Pembroke,	108 45	1,109 72	388 47	1,180 37	791 90	376 90
Pepperell,	–	870 79	895 60	1,641 19	745 59	901 22
Plainville,	–	–	299 98	–	–	317 85
Plymouth,	–	–	4,179 44	–	–	4,346 09
Plympton,	660 07	5,504 87	134 06	1,914 77	1,780 71	150 30
Princeton,	–	–	416 55	–	–	438 87
Quincy,	–	1,550 24	5,000 00	5,111 03	55 52	5,000 00
Randolph,	–	–	802 52	–	–	826 48
Raynham,	–	70 80	301 45	132 82	–	307 47
Reading,	5,959 66	6,974 30	2,095 45	7,388 90	5,293 45	2,181 77
Revere,	370 90	–	5,000 00	4,702 05	–	5,000 00
Rochester,	–	96 34	250 74	349 49	98 75	257 35
Rockland,	–	675 17	1,511 99	1,705 21	193 22	1,589 06
Rockport,	842 80	800 34	1,276 78	1.517 44	240 66	1,309 19
Rowley,	692 45	1,047 73	299 42	1,326 01	1,026 59	298 94

	1907. Reimbursement.	1908. Reimbursement.	1909. Required Expenditure.	1909. Total Expenditure.	1909. Reimbursement.	1910. Required Expenditure.
Salem,	$3,914 01	$2,818 68	$5,000 00	$5,668 00	$334 00	$5,000 00
Salisbury,	1,809 08	2,103 91	359 39	1,649 89	1,290 50	356 54
Sandwich,	–	494 08	400 10	528 93	128 83	405 29
Saugus,	13,168 61	12,243 30	2,054 48	9,801 77	7,747 29	2,082 51
Scituate,	–	–	1,661 85	3,013 45	1,351 60	1,790 26
Sharon,	–	–	1,030 79	–	–	1,105 51
Sherborn,	799 05	1,463 82	564 15	1,320 49	756 34	592 24
Shirley,	–	–	439 31	423 90	–	433 69
Shrewsbury,	–	–	598 21	–	–	653 07
Somerville,	–	–	5,000 00	3,159 21	–	5,000 00
Southborough,	1,495 95	984 33	706 45	1,812 33	1,105 88	733 56
Springfield,	–	–	5,000 00	–	–	5,000 00
Stoneham,	7,996 29	8,052 48	2,010 93	4,648 92	2,637 99	2,021 00
Stoughton,	–	–	1,402 83	–	–	1,399 13
Stow,	465 47	773 80	357 22	1,235 74	878 52	375 39
Sudbury,	532 94	2,390 60	497 76	2,048 29	1,550 53	501 99
Sutton,	–	–	492 79	–	–	516 34
Swampscott,	980 22	1,509 10	3,997 06	3,910 67	–	4,050 37
Taunton,	–	–	5,000 00	530 57	–	5,000 00
Templeton,	–	–	637 93	–	–	634 61
Tewksbury,	1,186 76	1,771 69	458 39	2,203 81	1,745 42	508 38
Topsfield,	2,028 50	1,725 26	501 98	1,906 30	1,404 32	508 09
Townsend,	–	–	460 92	396 55	–	469 92
Truro,	–	–	150 96	–	–	149 06
Tyngsborough,	1,114 74	1,505 38	209 87	2,102 14	1,892 27	223 53
Upton,	–	–	441 12	83 60	–	444 37
Wakefield,	2,268 99	4,297 83	3,441 43	5,249 02	1,446 07	3,635 64
Walpole,	–	–	1,671 86	674 58	–	1,750 25
Waltham,	1,104 73	3,340 13	5,000 00	6,233 19	616 60	5,000 00
Wareham,	–	–	1,508 32	–	–	1,884 49
Warren,	–	–	758 74	–	–	769 59
Watertown,	1,264 66	399 36	5,000 00	3,857 51	–	5,000 00
Wayland,	734 02	4,603 00	884 84	3,874 13	2,989 29	937 77
Wellesley,	–	587 42	5,000 00	6,772 15	886 08	5,000 00
Wellfleet,	–	–	392 38	–	–	495 76
Wenham,	2,051 79	1,577 95	935 63	3,912 73	2,977 10	1,007 04
W. Bridgewater,	638 65	1,342 17	488 69	988 09	499 40	508 54
West Newbury,	1,158 52	7,316 20	424 49	3,263 13	2,838 64	430 97

	1907. Reimbursement.	1908. Reimbursement.	1909. Required Expenditure.	1909. Total Expenditure.	1909. Reimbursement.	1910. Required Expenditure.
Westborough,	–	–	$1,273 09	–	–	$1,306 06
Westford,	$1,701 49	$2,727 41	700 98	$2,866 90	$2,165 92	733 29
Westminster,	–	–	308 50	205 04	–	314 09
Weston,	2,938 33	10,541 99	2,711 61	14,606 82	4,600 00	2,733 10
Westwood,	–	–	926 67	–	–	1,038 27
Weymouth,	1,060 83	1,542 86	3,093 46	3,469 37	300 73	3,197 19
Whitman,	–	–	1,896 61	–	–	1,949 34
Wilmington,	1,897 94	3,803 51	528 36	3,502 59	2,974 23	555 91
Winchester,	5,059 09	808 08	4,606 56	4,269 87	–	4,988 65
Winthrop,	–	–	4,303 07	–	–	4,797 44
Woburn,	4,252 45	7,624 59	4,476 08	11,937 83	5,969 40	4,478 69
Worcester,	–	–	5,000 00	–	–	5,000 00
Wrentham,	–	–	476 15	–	–	480 48
Yarmouth,	–	–	811 96	–	–	834 74

Summary of Recommendations.

1. To provide funds for establishing lookout stations with telephone connections in various sections of the State, to be used in times of drouth for detection of forest fires.

2. To pass an enactment regulating the use of fire balloons, which are extremely dangerous at times.

3. To enact a law defining the powers and duties of the State Forester with regards to forest fires, and authorizing him to deputize as many State forest wardens as he decrees necessary.

4. The advisability of regulating by law the treatment of the slash or brush resulting from lumbering or the cutting down of trees or brush, in order to lessen the future damages from fires.

5. The regulation and systematizing of the prices paid for fighting fires in different towns.

6. That the State offer, through the State Forester, to reimburse towns 50 per cent. for an expenditure for forest fire fighting equipment, or in making forest fire protection belts, to an amount not to exceed $250 for each town thus accepting such aid.

7. That the work of suppressing the elm-leaf beetle be placed under the State Forester, and subject to the same laws as now

govern the moth work, provided that sufficient funds are allowed to carry on the work.

8. That the local moth superintendents in towns and cities be appointed in a similar way as the forest wardens are appointed at present.

9. That the gypsy and brown-tail moth law be so amended that the State Forester may take supervision in cities and towns so desiring it, or where the conditions demand it.

10. That the work of the tree wardens in towns be subject to the approval of the State Forester.

11. That the State Forester be allowed sufficient funds for an assistant, whose duties will primarily be to master the forest fire problem throughout the State.

12. That the usual additional appropriation for gypsy and brown-tail moth suppression, which has been $165,000, be again made this year; and that an appropriation of $100,000 be made for handling the elm-leaf beetle, provided this work be placed under the State Forester; and that an additional appropriation of $15,000 be made for carrying on the forestry department work as outlined; total, $280,000.

13. That the State Forester be authorized to accept gifts of lands or funds on behalf of the Commonwealth, with the understanding that all net sales from the management therefrom shall be used by him for improving State forestry conditions, subject to the approval of the Governor and council.

14. It is of great importance, in order to make definite plans and to accomplish the best results, that the State Forester's appropriations be made available by the first of March. If it is decided by that time, we shall be in readiness to do effective work early in the spring, and the same amount of money will go much farther in controlling both insects and forest fires.

Respectfully submitted,

F. W. RANE,
State Forester.